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THE AVICULTURAL MAGAZINE welcomes original articles that have not been published elsewhere and that essentially concern the aviculture of a particular bird or group of birds, or that describe their natural history. Articles should be preferably typewritten, with double spacing, and the scientific names as well as the vernacular names of birds should be given. References cited in the text should be listed at the end of the article. Line drawings should be in Indian ink on thick paper or card; black and white photographs which illustrate a particular point in the article will be used where possible and should be clearly captioned. If authors wish their eventual return, they must say so when submitting the article and write their name on the back of each photograph.

ADDRESS OF EDITOR

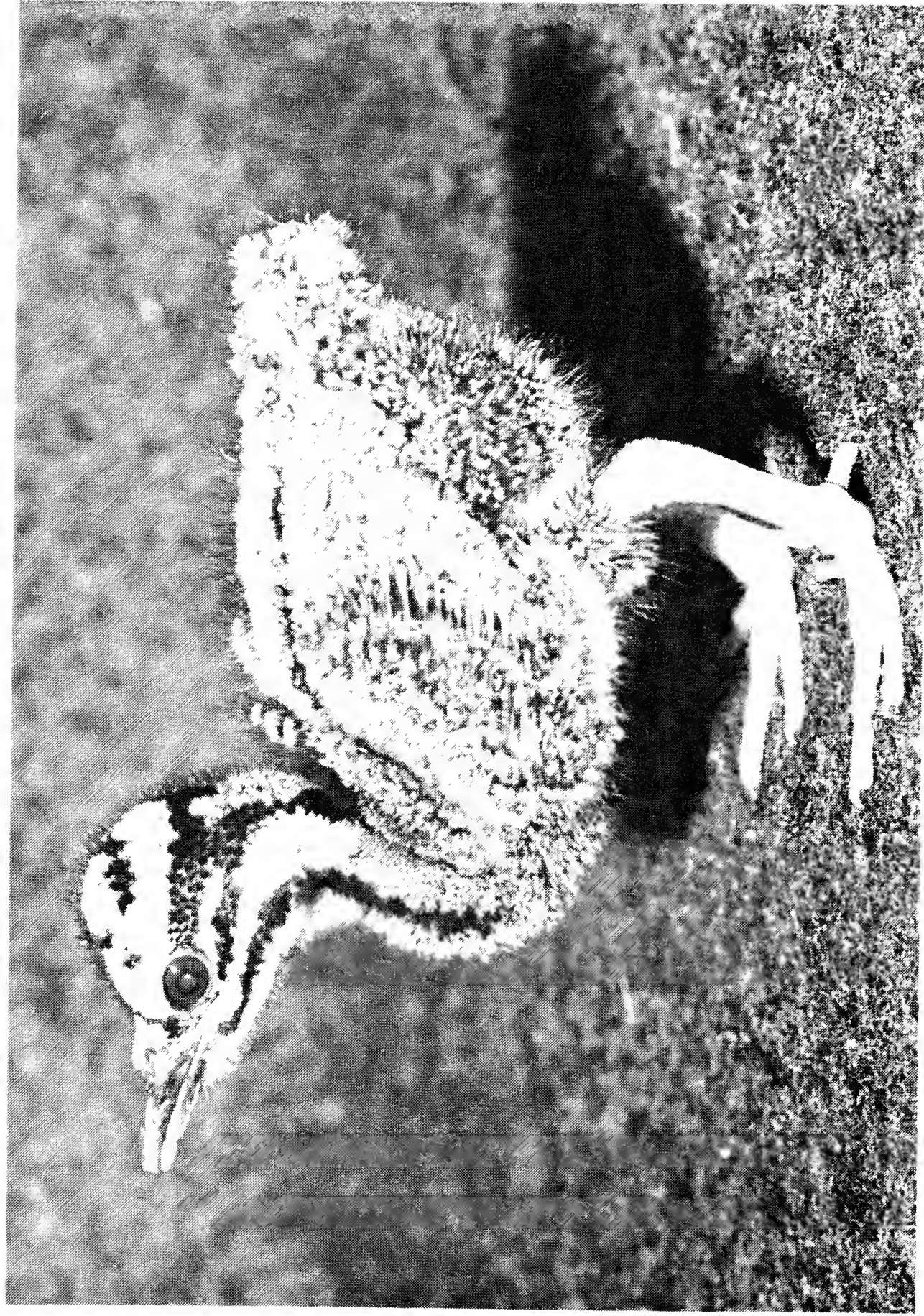
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Ron Garrison/Zoological Society of San Diego

Sun Bittern chick at the San Diego Zoo

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BREEDING THE SUN-BITTERN

Eurypyga helias

AT THE SAN DIEGO ZOO, USA

By LORAYNE HAYE (Senior Keeper)

The Sun-Bittern is the sole member of the family Eurypygidae, in the order Gruiformes. There are three subspecies: *E.h. major*, *E. h. meridionalis*, and *E. h. helias*. It is a non-migratory bird, ranging from southern Mexico to Bolivia. It inhabits forested areas wherever streams, rivers and marshes are present. In the wild, they feed on insects, crustaceans and molluscs.

Sun-Bitterns measure approximately 45cm in length. The sexes are very similar in coloration. The top and sides of the head are a steel grey except for a white stripe above and below the eye. The white throat area graduates down the neck and breast into a finely barred, fulvous and black plumage. The iris is red with a black pupil appearing to be horizontal rather than round.

Nesting and courtship in the wild

The nest is made on a tree branch anywhere from 2-6m high. The materials used are wet mud, grass and moss. The nest is built up into a cup-shape with a depression in the middle for the two to three eggs that make a clutch. The eggs are a cream colour with brown spots on the large end of the egg and measure approximately 42mm x 33mm. Incubation is between 19-22 days. Courtship and nesting usually occur from January to May.

History of Sun-Bitterns at San Diego Zoo

The first Sun-Bitterns were received at San Diego Zoo in 1939 with little available history. Later acquisitions were three birds in 1952, two in 1960, two in 1965 and two in 1969. More recently the Zoo acquired a male in 1983 from the Cincinnati Zoo. His captive hatching date is listed as 1965 which makes him 24 years old now. From 1983 to 1986 this male

lived in a flight aviary with other neo-tropical birds, but without a mate. On morning rounds he could be seen in the food pan busily making a nest of dried leaves, mud and grasses that he had dragged into this preferred site.

In 1986 the Zoo received a captive-bred, two-year old female Sun Bittern from the Houston Zoo. The pair was moved to an aviary measuring 3.5m x 4m x 5m. It was densely planted with ferns, bamboo, bromeliads and vines to afford the necessary privacy when nesting. Other birds exhibited in the same enclosure are:

Pompadour Cotinga	<i>Xipholena punicea</i>
Lance-tailed Manakin	<i>Chiroxiphia lanceolata</i>
Turquoise Tanager	<i>Tangara mexicana</i>
Silver-throated Tanager	<i>T. icterocephala</i>
Red-tailed Comet Hummingbird	<i>Sappho sparganura</i>
Black-masked Solitaire	<i>Myadestes ralloides melanop</i>

Diet

The daily diet for the Sun-Bitterns is comprised of chopped newborn mice, Zupreem, soaked trout chow, mealworms, crickets, whitebait fish, grated carrots and Super-preen vitamins. There was also a 'Soft-food pan' for the other species. It included chopped apple, banana, papaya, grape, figs, Zupreem, finch seed, soaked trout chow, mealworms, chopped spinach and Super-preen vitamins. These food pans were fed to the birds on a daily basis; however, in the breeding season the contents were increased.

Breeding

Twelve days after the male and female had been united in their new aviary, the pair had started a mud nest. This was built on a branch just outside the nest basket that had been provided. Thirty-four days later, the nest was completed with tendrils of moss hanging down the sides. There was, however, one detail the pair had overlooked: the surface was flat.

On 15th August, courtship was observed in the form of gentle swaying with the whole body. There were also vocalisations heard which sounded like low, guttural calls and a rapid clicking of the beak. These vocalisations were emitted by both the male and female. On 31st August 1986, the pair laid their first egg. Both birds assumed incubation duties. Two days later the egg was found shattered below the nest.

Later that same day, it was decided that the Sun-Bittern nest needed some outside help. Layer upon layer of mud was added to build up the rim of the nest (approximately 65mm of mud). The keeper returned to the aviary 30 minutes later to continue observations and found that the artificial rim had been removed by the pair.

On 23rd September another egg was laid and three days later it disappeared. On 13th October (43 days after the first egg had been laid) the third egg of the year was laid. This egg was laid in the nest basket that had been initially provided. The nest basket was a brown plastic crate, measuring 30cm x 75cm x 90cm. It was wired into place 135cm above the ground, supported by an up-ended log for stability. The inside of the nest was lined with straw, pine needles, moss and dried grasses, in that order. The nest lining was built high enough to allow the birds to see over the nest edge. Other sources had reported that birds which were unable to see over the nest rim while incubating would eventually abandon their nests.

The incubation period for the third egg was 25 days. The chick was found dead, on the ground, the next day. Necropsy reported the cause of death as possible trauma and hypothermia.

The year 1986 continued with a number of unsuccessful nesting attempts. Finally on 4th August 1987, a Sun-Bittern chick hatched. This time the incubation period of 28 days was slightly longer. At seven days old the chick was several shades of brown and grey. There were black stripes running horizontally down the chick's back. This down colour camouflaged the chick effectively in the nest box which could be a useful defence mechanism against the predation of neonatal chicks in the wild.

The parents fed the chick with newborn mice and mealworms exclusively for the first 14 days, even though the food pan contained other items. Crickets were omitted from the diet due to their alleged tendency to impact young birds. At 15 days, the parents were observed carrying small bits of Zupreem and fish to the nest and feeding the chick.

On 23rd August the chick fledged at 18 days old. The parents continued to feed the chick for seven days, and then ceased. The family trio got along well and there was never any aggression observed. On 1st September the chick was given a leg band, weighed (160gm) and moved to another aviary. The pair went back to nest immediately and reared another chick. The total number of eggs laid in 1987 was four, resulting in two chicks which were hatched and reared by the parents and two which were artificially incubated and hand-reared. All four chicks survived.

In 1988 the same pair produced three chicks from three clutches, with one chick surviving to date.

Previous references in the Avicultural Magazine:

1912: 254. ARTHUR DENMAN. Correspondence: Sun-Bittern trying to remedy defect in beak.

1914: 121-123. D. SETH-SMITH. The Sun Bittern (black and white plate showing display). (Bred at London Zoo, 1865)

- 1928:181-2. J. DELACOUR. Cariamias, Trumpeters, Sunbitterns, Coulans & Kagus
 1935: 107. A. EZRA. Breeding results from Foxwarren Park, 1934. (Note concerning attempted nesting.
 1959:136. J.J. YEALLAND. London Zoo Notes (Sun-Bittern eggs laid)
 1965: 191-2. WILLIAM G. CONWAY. New York Zoological Park Avicultural News (Sun Bitterns hatched).
 1968: 206-209. PETER J. LEVI. Some notes on the Sun-Bittern
 1978: 150-157. C.B. FRITH. The Function of Display and Coloration in the Sun bittern.

* * *

BREEDING MUSSCHENBROEK'S LORIKEET

Neopsittacus m. musschenbroekii

By J.G. THURLOW

(England)

Musschenbroek's Lorikeet inhabits certain mountainous regions of north-west New Guinea. It is basically a green bird with yellowish streaks on the crown and light green streaks at the cheeks and black lores. The throat and breast are red and this extends to the abdomen. The underwing coverts are also red and there is a band of red on the flight feathers which provides a dramatic flash of colour when the birds are in flight. The tail is green, tipped with yellow, and the underside is a yellow-orange. The legs are grey and the iris red.

Though at first sight sexually monomorphic, once my birds had been surgically sexed, it became apparent that the beak colour of the sexes differed, that of the hens being straw-coloured while the cocks' beaks were deeper yellow. My birds turned out to be two cocks and three hens.

The Lorikeets were purchased in autumn 1986 and were housed initially as a group in a small indoor aviary. Two pairs were soon formed though the birds continued to live in harmony, one pair being dominant within the group.

The diet consisted of nectar made by adding a teaspoonful of honey and a sprinkling of pollen grains to half a pint of warm water. To this was added Milupa 7 Cereal Breakfast and Mixed Fruit Dessert in equal quantities; a smaller quantity of the rather strong tasting Spring Vegetable Dinner was also included. The whole had the consistency of this

eam.

Fruit offered was diced apple, grapes and dried figs which had been soaked for 12 hours. When in season pomegranates were taken with great enthusiasm by one pair and the odd hen, though the second pair totally ignored them.

The Lorikeets enjoyed greenfood, taking sow thistle and chickweed when available; some lettuce and spinach was given and salad cress was provided daily and proved very popular.

Just prior to purchasing these birds I had read an article by Rosemary How in which she stated that seed formed a part of this species' diet and is, indeed, proved to be the case. Safflower was taken in preference to all other food but, together with sunflower, was rationed in an attempt to prevent obesity in the birds. Plain canary seed, mixed millets and pine nuts were offered and spray millet, which had been soaked for 24 hours, was given daily. This was sprinkled with SA37 twice weekly. Cuttlefish bone, mineral blocks and grit were all ignored.

Clean drinking water and bathing water were both offered daily and these birds proved regular bathers, particularly in sunny weather.

Regarding temperament, one hen was very steady from the outset and could readily approach the wire to investigate food items held in my hand. The other birds remained aloof and the cocks were positively timid.

I have read several references which state that lorikeets do not need much more care than parrots that are on a more seed-based diet. With this I would disagree! The nature of their food results in perches and indoor wire rapidly becoming soiled and sticky, necessitating frequent washing. Newspaper was used on the feeding shelves and floors of indoor compartments and this had to be changed at least every other day. Further, damp autumn and spring weather caused nectar and droppings that had been deposited on wall surfaces to go mouldy with remarkable speed, this again requiring frequent cleaning. I find seed-eating birds much more easily maintained.

In May 1987 the birds were placed in outdoor aviaries, one measuring 5 x 6 ft (4.57 x 1.83m), the other being 12 x 6 ft (3.66 x 1.83m). In both cases, one-third of the aviary had solid sides and roof, which gave much appreciated seclusion, and the Lorikeets also had access to a small door flight in which they spent much of their time. Nest-boxes measuring 12 in square x 12 in deep (0.15m square x 0.30m) were provided in the covered part of the aviaries and shavings were used as a nest base. Despite assurances by authors that lorikeets always roost in nest-boxes, mine had obviously not been informed of this and steadfastly refused to enter them, preferring to roost in the most exposed part of the flight against the

netting (thankfully double). Removal of perches in an attempt to persuade them to change their habits failed as the birds just returned to the place where the perches had been and roosted on the wire!

After some months of this behaviour the Lorikeets did start to use their nest-boxes, one pair preferring their box to be at the covered end of the flight, whilst the second pair would use the nest if it was positioned in the open.

Interestingly this latter pair changed their habits when they went to nest, using a second box positioned under cover.

Aviary furnishings consisted of the branches of apple, elderberry and willow and the birds enjoyed stripping the bark from these. Willow appeared to be preferred to all others and when fresh, the Lorikeets would take small pieces of bark in their beaks and this was then rubbed over their legs and feet and amongst their feathers. I am unsure of the significance of this, though the behaviour reminded me of anting seen in other species.

The Lorikeets were initially in aviaries some distance apart and there was much vocal contact between the pairs. Later in the year they were moved closer together and judging by their behaviour it was apparent that this close proximity was to the birds' liking.

They wintered outside with no heat provided though both pairs were using their boxes. The birds appeared unperturbed by the cold, though translucent plastic sheeting was placed on the exposed north and east facing sides of the aviaries. By this time the unpaired hen had gone to her friend who had a spare cock bird.

In early February 1988, the hen of Pair 1 (the relatively steady hen) started to spend part of the day in the nest-box and an inspection on the 17th revealed two white, rather spherical eggs, very approximately the size of a blackbird's. Only the hen appeared to carry out incubation duties and she sat tight, rarely being seen in the flight. On 11th March I thought I heard a chick but did not interfere with the birds. Meanwhile, judging from the behaviour of Pair 2 they too were nesting, though in this case the cock spent a great deal of time in the nest-box.

On the morning of 17th March, all four birds were in the flights and appeared much disturbed. I checked both nests and found that of Pair 1 was empty with no trace of eggs or chicks while Pair 2 had two eggs, obviously apparently clear and both were cold.

During the above nesting activities I rarely saw the birds displaying though the cocks would lean over their mates when excited and open their wings momentarily exposing the vivid red of their flight feathers. I also observed the cock of Pair 2 enact a display prior to mating in which he walked in a wide arc on a wooden platform positioned in the flight close to a perch on which the hen was sitting. His body was held at

right angle away from his mate and his head was held outstretched. This was performed a number of times in quick succession, and on each occasion he would then fly to the hen and approach her before repeating the performance. Treading eventually occurred which was achieved rapidly, the cock bird balancing with outstretched wings.

Pair 1 nested again in May with one egg being present on the 6th, and while incubation of this clutch was underway that I realised how vocal the sitting hen was, producing a loud chick-like call which proved irresistible to the local cat population. With this in mind, and the failure of the first round, it was decided to incubate the eggs artificially and hand-rear any chicks that hatched. These eggs were duly collected by Databird Worldwide on 19th May and though both hatched, one chick died at two days old, the other being successfully hand-reared.

The first egg hatched on 31st May giving an incubation period of 25 or 26 days. The chick was covered in grey down with a small circle of white down in the nape of the neck. This bird was collected from Databird on 31st July when it was fully independent, though it still liked to be spoon-fed. It resembled the adults in plumage though the red on the breast and abdomen was less extensive than in the mature birds.

Pair 1 went down yet again on 18th June, closely followed by Pair 2, and I feel that there was a degree of stimulation between the pairs resulting in a certain synchronisation of nesting. The fact that Pair 2 did not nest in May was due, I believe, to the length of time their first clutch was left with them, the single fertile egg failing to hatch.

The eggs were again taken for artificial incubation and of the four fertile eggs, three hatched, one being dead-in-shell, though only one chick was successfully reared, the others again dying shortly after hatching. No further attempt at nesting was made by either pair.

The decision as to whether or not to allow the parent birds to hatch and rear their chicks can be a difficult one, particularly with a species not well represented in aviculture. The above results of two chicks from six eggs does not appear to be a very good record.

However, following the loss of the first clutches I felt that artificial rearing might result in some chicks reaching adulthood and my plan was to allow the parents to rear their chicks themselves in 1989. Sadly my plans have been thwarted; I lost the cock of Pair 2 in the autumn as a result of a tapeworm infection. He was treated for this condition though I regret that the treatment came too late. Also, the first chick to be reared died suddenly at six months old and a post mortem failed to reveal the cause of death. The remaining birds have subsequently gone to a fellow aviculturist as pressure of work meant that I was unable to continue to give them the attention that they required. I hope they will nest with similar enthusiasm for him.

I believe that this is the first time that this species has been bred in this country and I hope that those keeping Musschenbroek's Lorikeets will make every effort to increase stocks of this bird, attractive in both colour and character.

Previous references in the Avicultural Magazine:

- 1940: 3. DAVID SETH-SMITH. The Foxwarren Collection.
7. A. EZRA. Breeding results at Foxwarren Park, 1939. (Hopes for a pair of Musschenbroek's Lorikeet - first to be imported into Britain)
 1950: 211-13. The DUKE OF BEDFORD. The nesting of Musschenbroek's Lorikeet. (Chick hatched but not reared).
 1954: 77. WALTER H. TURNER. Correspondence. (Difficulties of rearing Musschenbroek's Lorikeet - Sydney, Australia).
 1956: 117. SIR E. HALLSTROM. Parrots in the Hallstrom Collection and the Taronga Park Zoo (Musschenbroek's Lorikeet bred).

As described above, Musschenbroek's Lorikeet *Neopsittacus m. musschenbroekii* was bred by Mr. J. Thurlow in 1988 and this is believed to be the first success in this country. Anyone knowing of a previous breeding in Great Britain or Northern Ireland, or of any other reason that would disqualify this claim, is asked to contact the Hon. Secretary.

* * *

BREEDING THE COLLARED FINCHBILL

Spizixos semitorques cinereicapillus

By KEVIN EATWELL

(Swindon, Wiltshire)

The Collared Finchbill and the only other member of the genus, the Crested Finchbill *Spizixos canifrons*, belong to the Pycnonotidae, the Bulbuls. *S. semitorques* has two subspecies: *S.s. semitorques* from South China, and *S.s. cinereicapillus* from Taiwan.

Both species of Finchbill were virtually unknown in British aviculture until late 1986 when seven males were imported; since then large numbers have been imported from Taiwan.

The Collared Finchbill is predominantly olive green with yellow in the centre of the abdomen. The tail has a broad, dark brown, terminal band, blending with the olive green. Its name derives from the broad white band which separates the slate grey head from the olive breast.

There is a white spot at the nostril and another at the base of the lower mandible. The sides of the head are streaked with white. As the name suggests, the ivory-coloured bill is similar to the bill of a mannikin and is unique to the two *Spizixos* species.

The feet and legs are flesh-coloured.

Recently I have been fortunate enough to purchase a sole cock of the nominate race *S. s. semitorques* from China which differs in that the coloration is more blue-grey than olive but there are no other noticeable regional differences.

In late 1987 I acquired a pair of the Taiwan race *cinereicapillus* which showed a difference between the sexes in overall size and coloration of the head, the male being larger and having bolder contrasts on the head.

My birds are fed on a strict diet of Claus Honey Food Type III in dish, with diced fruit given separately. Birdquest additives are used to increase the birds' vitamin intake. They receive fresh water daily and have access to bathe.

In 1988 the Collared Finchbills were placed in a small, planted flight with an inside enclosure for feeding. The cock sang continuously and in June nesting started in a clump of fir, 5ft (1.52m) above the ground. The nest was made of coconut fibre. Two eggs were laid by 19th June and were white with purple spots concentrated towards the blunt end, which were surrounded by underlying violet.

Two chicks hatched on 14th July which was surprising as most bulbul eggs take 14 days to incubate. I can only assume that the first round was a failure. The chicks were typical of other bulbul chicks but the beaks showed clearly that they were finchbills. They were left strictly alone and the young were reared on mealworms but after fledging, at 15 days, mostly Claus and fruit. The chicks were a very dark green with black heads; they had no tails and no method of controlling their flight so they were placed inside. They cheeped a great deal but survived the night and were promptly shooed outside again by the parents the next morning. They soon grew and their plumage changed to resemble that of the parents. They were taken away at 40 days old.

Since then they have moulted out to be a pair so I have acquired another pair in order to breed unrelated Finchbills this year.

* * *

BREEDING THE RED-TAILED LAUGHING THRUSH
Garrulax milnei
AT PADSTOW TROPICAL BIRD GARDENS
(Cornwall)

By CHRISTOPHER M. HAINES
 (Head Keeper)

The Red-tailed Laughing Thrush *Garrulax milnei* is a bird of humid secondary mountain forest, scrubland and grassland at altitudes above 1000m, ranging from southern China (Yunnan and Tonkin) to Burma, Laos and Thailand (De Schauensee, 1984). Believed to be fairly abundant in the wild, it was seen at Foxwarren Park in 1939, having been collected by Charles Cordier, but appears to have been imported again only recently and is not, as yet, widely seen in zoological collections, no doubt partly due to its sober plumage and skulking habit.

This species is closely related to the Red-headed Laughing Thrush *G. erythrocephalus*, from which it may readily be distinguished by its reddish (rather than yellowish) wings and tail. It has a rufous crown, nape and hindneck; the lores, supercilium, cheeks and throat are black, and the ear-coverts are silvery-grey. The underparts are grey, shading to olive-grey on the under tail-coverts; the upper tail-coverts and rump are olive. The iris is dark brown. The bill, legs and feet are black. This species measures approximately 250mm long. It is not sexually dimorphic and there is no reliable way of distinguishing between individuals, which are not colour-ringed or have some distinctive feature.

A trio of these birds is kept here in an L-shaped flight, grassed and planted with shrubs and small trees, around the bases of which are areas of bare earth. The flight area is slightly over 90 square metres, and the height is about two metres. Old Cornish stone walls form the angular back of the flight, and both ends are protected by corrugated plastic screens (behind one of these are housed a pair of White-crested Laughing Thrushes *G. leucolophus*). There are two small boxes (containing perches) in which the food dishes are placed, and a roosting box in which a 100w bulb provides light and warmth during the period after fledging. This box, which projects beyond the end of the flight, is about 600mm square, and about a metre high, the base being about one metre above the ground.

This accommodation is shared with a pair of White-cheeked Touracos *Tauraco leucotis*. No sign of interspecific aggression has normally been observed, but the Thrushes were seen to chase the Touracos occasionally during the incubation and rearing periods. This has not been seen to happen

h the Red-headed Laughing Thrushes, which have been bred at Pad-
w in a mixed flight shared with touracos.

The Red-tailed Laughing Thrushes are fed on a diet of our own insect mixture, with smaller quantities of apple and diced ox heart, with mealworms and Vionate. The main feed is in the morning and mixed fruit and mealworms are fed in the afternoon. During the development of the young, extra mealworms were provided - initially very small mealworms every two hours during the day, changed gradually to normal mealworms at around midday and before dusk, in addition to extra mealworms during the usual feeds.

The breeding trio were acquired as young adults in June 1987. They are moderately shy birds, similar in temperament to the Red-headed Laughing Thrush. They tend to spend most of their time either in the nest-bush, the branches in the back corner of the flight, or on the ground, from which they hop rapidly. Only once has any intraspecific aggression been observed. On that occasion, the chick was about three weeks old, when two of the birds (presumably the pair) were perching in front of the food dish, positioned near the back corner of the flight; the two were calling continuously and threatening the third adult, when it approached too close. This bird was calling also and moving in an agitated manner between the branches in the back corner and a bush near the front of the aviary. After about 10 minutes, the calling subsided and the pair fed the youngster. The first signs of possible breeding activity were shown in mid-April, when they were seen to be carrying plant material. By mid-May pair formation was well under way, and the third bird was observed being chased around the flight. During June and July, the nest began to take shape, being a fairly tidy cup-shaped construction of grass stems, plant fibres and other plant material.

The nest was on a wire platform, in a fork of a bush, near the roosting box and away from the White-crested Jay Thrushes' aviary.

On 11th August, a white egg with brownish speckles, was seen in the nest, followed the next day by a second. These eggs were ejected on 25th August, and found to be infertile. On 30th August, the birds were again seen to be sitting on two eggs. Due to the difficulties of distinguishing the gender or the individual identity of the birds, it was not obvious which bird, or birds, incubated the eggs.

The first egg hatched on 16th September, and the second two days later, so the incubation period appeared to be about 17-18 days, which is slightly longer than would be expected. By comparison, 14-15 days is the incubation period given for the Red-headed Laughing Thrush (Coles, 1979). All three adult Red-tailed Laughing Thrushes fed the very small mealworms to the two chicks and within a week both chicks were nearly fully

feathered. The head and wings feathered up most rapidly. At that stage the plumage was uniform dull greyish-brown, with the rufous patches not yet being obvious.

By 2nd October, when both birds left the nest at about two weeks old, the plumage had changed to echo that of the adults, although the colours were rather less pronounced, and their tails were quite short.

During the evening of 3rd October, the smaller chick was found on the aviary floor and though its condition did not look entirely satisfactory, it was left in the flight as the adults were still seen to be feeding it. The following morning, however, it was in poor condition; it was seen to be chilled and immediately removed and placed in an incubator, where unfortunately it failed to recover. The loss of this chick prompted serious consideration as to whether to remove the other chick for hand-rearing. However, as it appeared to be perfectly healthy and was back in the nest being fed by the parents, it was decided to leave it in the flight.

This decision proved to be wise, as the parents continued to rear the chick. When it was four weeks old, the light in the roosting box was turned off for the first time during the day. At around that time it was first observed flying and pecking at the ground, though still being fed entirely by the parents. By 18th October (at 32 days old), it was pecking at the nest, and also at leaves and twigs of the nest bush. The adults were seen adding further material to the nest. Around that time, the amount of food supplied by the parents after each feed had decreased considerably and it became apparent that the young bird was partly able to feed itself. It was also flying fairly well.

On 23rd October the nest was largely destroyed. When the livefood was introduced - as usual being scattered over an area of bare earth - the chick was not seen to receive any food, though it continued to hop along the branches, between the adults. It was also observed indulging in mutual preening with one of the adults. Two days later, it was seen begging for mealworms immediately after some had been introduced. The adults appeared to ignore much of the begging behaviour, either retreating along the branch or merely looking away, but occasionally one would transfer a mealworm into the youngster's gape.

On 28th October, the day after the light in the roosting box was first left switched off overnight, the young bird was observed feeding itself for the first time. At six weeks old it was seen to take mealworms, though rather inexpertly. However, the parents were still feeding it. Two days later it was first seen to take fruit (apple), and the next day was observed standing in the food dish, taking both apple and insectile mixture, though continuing to drop much of the former. At that stage the midday and evening mealworm feeds were discontinued.

Regarded then as being fully independent, the young Laughing Thrush was ringed on 2nd November, so that it might subsequently be distinguished from the original adults. It had not yet attained full adult plumage, the basic coloration being a medium greyish-brown, with the rufous crown and reddish wings not yet as bright as those of the adults and the silvery ear-verts not as noticeable. However, at the time of writing (17th November 1988) it is sufficiently similar to the adults to require a second glance to identify it.

ACKNOWLEDGEMENTS

I wish to acknowledge the help of previous keepers, Richard Hughes, Simon Hunt and Neil Mitchell, for the recording of the earlier observations.

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SCHAUENSEE, R.M. (1984). *The Birds of China*
Smithsonian Institution Press, Washington D.C.

Additional references in the Avicultural Magazine:

- 40: 266. P.H. MAXWELL. Note: Red-tailed Jay Thrush *Garrulax milnei indochinensis* (species does well in captivity).
42: 142-144. SYDNEY PORTER. The Red-tailed Babbling-Thrush.

As described above, the Red-tailed Laughing Thrush *Garrulax milnei* was bred by Padstow Tropical Bird Gardens in 1988 and this is believed to be the first success in this country. Anyone knowing of a previous breeding in Great Britain or Northern Ireland, or of any other reason that would disqualify this claim, is asked to contact the Hon. Secretary.

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A TECHNIQUE FOR HAND-REARING PARROTS AND SOME OTHER ALTRICIAL NESTLINGS

By CHRISTINE SHEPPARD

(Curator, Ornithology. New York Zoological Society, Bronx)

Aviculturists have progressed considerably in recent decades at bird replacement parents for young birds. However, progress in the areas of nutrition and brooding has been greater than that in nest sanitation - though the parents definitely have the edge on efficiency. Especially with parrots, keeping a chick clean requires frequent changes of bedding and frequent cleaning. At the Bronx Zoo we have evolved a technique which works exceptionally well, especially for species like the Pesquet's Parrot, which produces very soft faeces. This method has also been useful for other parrot species, including the Palm Cockatoo, and for touracos. Essentially, chicks are suspended on a screen which allows droppings to fall through usually on to a pan which can be removed for cleaning (see plates).

The container is constructed from two cylinders with slightly sloping sides. Early models were made from one quart yogurt containers; when chicks grew larger, we used buckets which had originally contained wallpaper paste. Slightly more sophisticated versions have since been created out of plastic freezer containers.

The floor material is a rubberised mesh ('Neotex' matting from Thomson Scientific), commonly used by laboratories to line sinks as a protection from dropped glassware. This can be easily cut with scissors to the desired size. Mesh openings are 7mm x 7mm and the gridwork is one millimetre wide. The mesh is placed over the top of one cylinder and the second cylinder is then jammed into the first, stretching the mesh into a taut surface. The surface is soft, safe for a chick's feet and also permits the toes to grip. With chicks like the Palm Cockatoo, which are dependent for a long time and quite large, we use the system until the weight of the chick causes the mesh to bow (about 400-450g) (Sheppard & Turner, 1987). Nestlings of lighter species begin to perch long before this time.

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New York Zoological Society
A young Pesquet's Parrot, hand-reared at the Bronx Zoo

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THE BLACK-HEADED MUNIA

Lonchura malacca

By ROBIN L. RESTALL

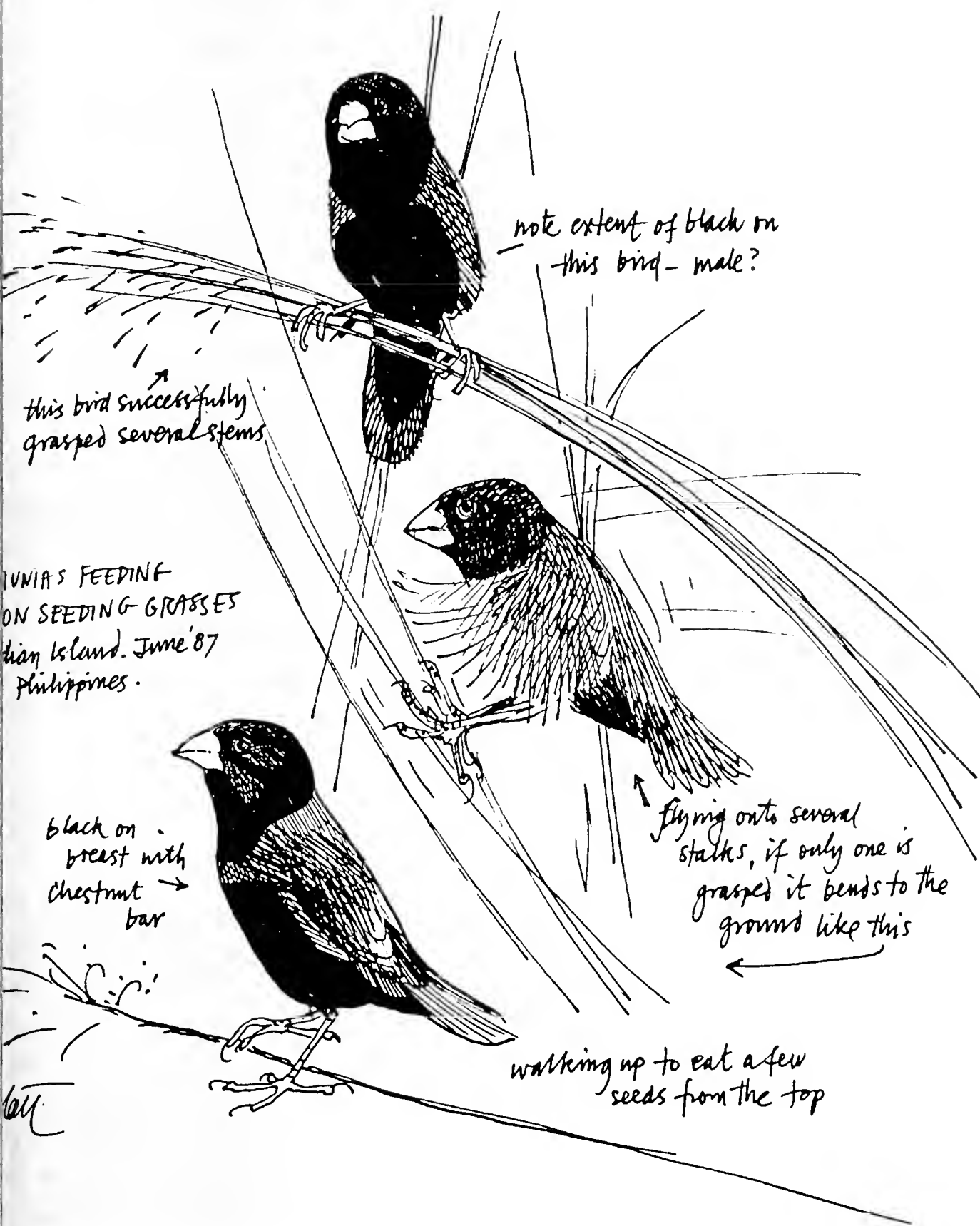
(London)

My business trip had taken me to Manila in the Philippines. For a very rare once I found myself in an exotic country over a long weekend, instead of travelling, and I had determined to take advantage of it by 'getting away from it all'. I flew down to Cebu City on the island of Cebu, then drove three hours or so over the mountain ridge and down the south-west coast. A short boat ride took me to a genuine tropical island paradise in the South China Sea, Badian Island. There, for almost three days I sunbathed, swam, ate fresh fruit and seafood --- and studied the Black-headed Munia.

I can just hear somebody laugh, saying that if you're going to travel halfway around the world to watch birds you might as well watch something worthwhile, or at least different. That's OK, I've watched Monkey-eating Eagles and Victoria Crowned Pigeons and Trogons and Bellbirds. I just happen to be inordinately fond of finches and for me, to discover several flocks of one of my best-loved birds was a real thrill. The smallest flock was eight birds, the largest 14. They appeared every morning and afternoon feeding on the ground in the garden around my bungalow and around the swimming pool. On several occasions my Nikon 7 x 50 binoculars were focussed down to their very nearest point, so close did the birds come to me. I have kept munias on and off for 40 years now but this was the first time I'd seen them feeding naturally, and it was fascinating.

The birds were feeding on grasses dotted with weeds of the Composita family, some looked like dandelions, others groundsel. A bird would fly at a bunch of stalks with feet spread and grasp *several* stems of grass. Its forward momentum would bend the bunch over slightly and the bird would be able to reach at the seeding heads where it would take up to half-a-dozen beakfuls before flying on. Often as not, a bird would land on a single stem of grass, its weight would bear the stem to the ground whereupon the birds would quickly hop along to the head of the grass and take several bites. The weeds would invariably be borne to the ground where part of the seeding head was bitten off and eaten. The flock moved on, covering an area roughly 5-10 square metres at a time, never exhausting the seed supply. After they had gone, there was no sign that they had been there feeding, no grass stems were broken - all had sprung back up again.

When disturbed, the birds would fly into the nearby Bougainvillea or other shrub and sit still. Not for the first time was I amazed at how bright



coloured birds (and don't be fooled, a chestnut and black munia on green grass in tropical sunlight is brightly-coloured) can virtually disappear when sitting still in a tree. Very soon they would drop back to the ground with *zitt zitt* contact calls.

What excited me most about the birds was their plumage. The chestnut iridescently glowed, and the black heads shone. In plumage they were tight and sleek like any Java Sparrow. All were in adult plumage. Some appeared

to have black heads while others had distinctly dark brown heads. I was reminded of my Brown-headed Munias at home, which are of another race of *L. malacca* than the one that I am describing on Badian Island. In most birds the head of the male is distinctly darker than that of the female, and I wondered if that were also the case with the birds I was watching. From time to time it seemed as though there were several bonded pairs in a flock as two birds would often appear to be working the grasses together. I noticed this several times. It also seemed to me that in every case of an apparent pair, one bird had a blacker head and more noticeable yellow fringe to the tail edges.

At this point it is appropriate to discuss the species as a whole.

Nomenclature

In his invaluable *Estrildid Finches of the World*, Derek Goodwin introduces the *Lonchura* munias with a discussion on their relationships to each other. He separates them into several species-groups, one of which includes *maja*, *malacca* and *pallida*.

	Species-group: CHESTNUT MUNIA
<i>maja</i>	White-headed Munia <i>L. maja</i>
<i>pallida</i>	Pale-headed Munia <i>L. pallida</i>
<i>malacca</i>	Tri-coloured Munia <i>L. malacca</i>
	Black-headed Munia <i>L. atricapilla</i>
	Javan-Maja Munia <i>L. ferruginosa</i>

Essentially, Goodwin concludes that these birds are all races of the single species *L. malacca*. For convenience of handling in his book he keeps them separate but confuses by referring to each one as the 'Chestnut Munia'. In their fascinating but highly technical paper on the evolutionary genetics of Estrildidae, Kakizawa and Watada use protein electrophoresis to construct a genealogic dendrogram to define genetic distances between various estrildids. They found there to be no genetic distance between *L. atricapilla*, *malacca* and *maja* but *ferruginosa* was not included in their research. Therefore, they support, by electro-chemical analysis, what Goodwin concludes by logic.

Following the Geographic Species Concept, which holds that if two birds occupy the same area but do not normally or naturally interbreed then they are not conspecific, it seems sensible to me to regard *L. maja* and *L. pallida* as sibling species but nonetheless separate species. Therefore I offer the Chestnut or Black-headed Munia *Lonchura malacca* as follows:

- L.m. malacca* Tri-coloured Munia. Black head, white breast and flanks (cream in fresh plumage), rest of underparts black. Chestnut above. Origin: India.
- L.m. atricapilla* Black-headed Munia. As *L.m. malacca* but the parts that are white on the breast and flanks of the Tri-coloured Munia are chestnut, remaining underparts black. Fringes of tail feathers orange to yellowish. Origin: NE India, SE Nepal, through Bangladesh to Burma.
- L.m. rubroniger* As *L.m. atricapilla* but tail fringes more reddish. Origin: Nepal and neighbouring India.
- L.m. sinensis* Chestnut Munia. Black head, entire body light chestnut with very little black on belly or undertail, tail edges yellowish. Origin: Thailand, Malaysia, Lowland Sumatra.
- L.m. deignani* As *L.m. sinensis* but tail edges deep orange-red. Origin: N Thailand and Annam.
- L.m. bakatana* As *L.m. atricapilla* but a paler chestnut. Origin: mountains of N Sumatra.
- L.m. formosana* Brown-headed Munia. Head dull brownish black, greyish on neck, body dull or mauvish chestnut, tail edges reddish. Females paler heads. Origin: Taiwan, N. Luzon.
- L.m. jadori* Philippine Black-headed Munia. Head rich dark brown to blackish, body bright chestnut, centre of breast, belly and undertail noticeably black. Tail edges yellowish. Females slightly paler on head. Origin: Philippines and E. Indonesia.
- L.m. ferruginosa* Javan Maja Munia, perhaps better referred to as the Black-throated Munia. Top and sides of head and nape white, underparts from bib to under tail-coverts black, variable amount of chestnut on side of breast and flanks. Chestnut above. Origin: Java.



Black-headed Munia
L. m. atricapilla
 Tri-colored Munia
L. m. malacca

Description;

The above descriptions are perforce superficial but serve to aid discrimination between the races. The nominate *L. m. malacca* is not typical of the species because of the white on the breast and flanks, similarly *L. m. ferruginosa* with white on the head and black from bib to under tail is singularly easy to recognise. The rest have the body chestnut-brown with black on the belly and the edges of the tail orange or yellowish. All races have a pale bluish-grey bill, at times almost white. All races have the feet bluish-grey with the main scales sometimes blackish. Generally speaking the sexes are alike but in birds of equal age *and condition of plumage*

the colour of the upper tail-coverts and edges to the tail feathers is weaker in females. The culmen of the male is usually *slightly* higher and fuller and may be felt more as a bump when running your forefinger along the crown of the head to the culmen (see Restall, 1987, on the Black-rumped Munia). Males, of course, may be distinguished by their song, and display. Incidentally, I automatically place coloured plastic split rings on every new bird I acquire and keep a record card. When any noteworthy incident - such as a song display, or nest-building is noticed, *it is written down* against the colour code for that bird. It is amazing how easy it is to forget whether the bird that sang was the pink left, or the white right.

Juveniles are apparently indistinguishable between races until they begin to show adult feathering. They are dull brown above and pale brown below, one might say 'mousy'.

Habitat and feeding

They are primarily birds of grassy areas, from rice fields to gardens. They are gregarious, moving around in small groups, often in large flocks when not breeding, feeding on seeds and young, forming seed heads on the ground and on standing plants, mostly grasses and weeds that grow among grasses. The species is very widespread over most of the Indian and SE Asian region. When disturbed, they retreat to nearby cover but quickly return to the grassy areas to resume feeding.

In captivity they readily take canary and millet seeds. I have seen newly-caught birds feeding on paddy hung in bunches in the cages. I have brought back bunches of this paddy from my travels and the birds take it as avidly as millet sprays, but in my experience will rarely take paddy loose from the ground or when mixed with other seed. Flowering and seeding grasses are taken readily. Lettuce and chickweed may be taken. None of my *Lonchura* have ever taken soft foods, not even Ben-lense, although I have found sufficient references in the past to suggest that soft food should be offered (Restall, 1975). They are great bathers and their plumage condition will be reflected in the frequency with which they are able to bathe.

Voice

The first pair of birds I ever kept was a pair of *L.m. malacca*, and they lived short, fruitless lives in a Yorkshire Canary show cage. Their incessant *peet* call to contact others of their kind fascinated me, and drove my old step-father crazy. One thing I have noticed with several species of munia recently is that the males and females have different call notes, but can find no reference to this in the literature. With some species, like *L. quinticolor*, *L. grandis* and *L. leucogastroides* it is quite

noticeable. My pair of *L. leucosticta* sound almost like Zebra Finches, a tooting *beee* that seems the same from each bird, but as I am not 100% sure that they are not two females, it is not significant that I cannot tell them apart. Ironically, I have sat down to write these notes, inspired by watching *L.m. jagori*, having given away my last trio of *L.m. formosana*, so I cannot separate the birds and begin a controlled study.

I do suggest to anybody with easy access to a few of any race of the species to cage them separately and listen carefully to see if they can detect any difference in the call note. It is a tonal difference, not a different sound.

Nesting and breeding

The nest is naturally a sphere of grasses or leaves from grass-like plants woven among bamboo, in a shrub or thicket, usually within human reach of the ground - or occasionally over water. The entrance hole is on the side with a slight tunnel protruding. The inner lining is of finer grasses. In an aviary they will build their own nest of raffia, reeds and grasses if the conditions are right. I have had *L.m. sinensis* build in a bark frame work stuffed with dried hay and grasses, also *L.m. formosana*. In each case the entrance tunnel was some three inches long and the cavity lined with coconut fibre. On two separate occasions *L.m. formosana* nested in an Australian finch box (square with a half-open front) in which I had twisted a handful of dead grasses and coconut fibre. Eggs were laid several times but were deserted before hatching almost certainly due to disturbances caused by local cats.

The eggs are small, oval and white. My birds laid clutches of three, four and five but a normal clutch in the wild is apparently five or six and may be of seven. Both male and female share the nest-building, incubation and rearing of the young. The young are not super precocious like those of seed-eating birds in the neo-tropics, but fledge between three and four weeks. Compare that to, say, a Jacarini Finch *Volatina jacarina* which will fledge in nine or ten days!

There is no doubt that these munias will breed readily and easily, and rear on an all-seed diet, if conditions are suitable. What are suitable conditions? From my observations the first condition is not to have any distracting birds in the same enclosure or in the enclosure alongside (I mean the other side of the wire mesh). My male Brown-headed Munia was continually distracted by one or other of the Pallid Munias in the same flight.

He successfully stole her (?) away from the other (male?), usually ignoring the two females of his own species. Once the Pallids were removed he quickly paired and they nested in an Australian finch box. Later on

introduced some Great Munias *L. grandis* into the flight and once again he came distracted, he became obsessed with courting whichever of the bigger 'super *malaccas*' would sit next to him. His song and dance usually ended up with peering behaviour by the larger bird. So I removed the brown-heads as the *grandis* are very rare in captivity and I was trying to breed with them. I have noticed this ability of male *Lonchura* to attempt promiscuity several times and have concluded it is a major factor in inhibiting successful breeding. Perhaps two mated pairs is ideal, providing nesting sights are plentiful and widely spaced. The *ideal* method for me is to place four or more birds in an enclosure where *they can be observed without disturbing the birds*, once true bonded pairs are identified they can be placed in suitable enclosures, only one pair to an enclosure - but within sight and sound of others as they are gregarious birds, and I believe this is to be helpful.

Housing

I have bred munias in all-enclosed, wire-fronted cages, all-wire cages, small indoor flights, and large outdoor flights. There is no ideal and it is a little cavalier to suggest the perfect enclosure. Having seen what many Australians regard as 'normal', I suppose a large, sunny flight with many clumps of tall, seeding millet grass, open areas with seeding *Poa annua* and a few compositae, with some privet hedging to provide cover would be ideal. Food and water would be in a shelter area where the light comes in at 5 or 6 o'clock in the morning and goes off at 7 or 8 o'clock in the evening. Having lived in the tropics and neo-tropics I am very aware of the birds having 13 hours or so of light all the year through, and consider this essential. I have also come to the conclusion that tropical finches will often come into breeding condition in October/November, and if they have 12-14 hours of light, will breed then. At the time of writing (November 1987) I have three species of *Lonchura* nesting in my birdroom.

My favourite cages are about 30in or 36 in (0.76 or 0.91m) cubes. Recently I have been experimenting with putting plants in these cages. This provides distraction for the birds, but I am not convinced that it helps breeding. However, a sense of security when humans are not around is very important. (It is even more important when we *are* around!).

Summary

The Black-headed *Lonchura malacca* is a widespread species, typical of *Lonchura* in habits and habitat. There are several races, often treated as distinct species in aviculture, but conversely are often treated as one single bird, the 'Chestnut Munia' in ornithological literature. Some races

are sexually dimorphic, with the males having darker-coloured heads. It seems probable that males may have a different tone of contact call than females; if this can be confirmed, it would be an enormously helpful aid to aviculturists. They will settle and breed in confinement, both in cage and aviary but can easily be distracted and if breeding is intended should be taken seriously by the keeper.

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THE GREEN-WINGED KING PARROT

Alisterus chloropterus chloropterus

By PROFESSOR J. R. HODGES

(Pinner, Middlesex)

A magnificent pair of Green-winged Parrots which I saw on a recent visit to the Hong Kong Botanical and Zoological Gardens brought back memories of the days soon after the war when, as a university student, I cut lectures occasionally to waste precious hours in front of one of the aviaries at the London Zoo, gazing at the Green-winged Kings and dreaming vainly of the day when I might possess such avicultural treasures.

Green-winged King Parrots are even more striking in appearance than the better known Australian King Parrot *A. scapularis scapularis*. Their red is darker, and they have, as their name implies, a conspicuous band of yellowish green contrasting with the dark green of the rest of the wing. The mantle and the back are a lovely deep blue and the tail is marked with blue.

They are classified into three races: *A. chloropterus chloropterus*, *A. c. callopterus* and *A. c. moszkowskii*, which inhabit Eastern, Central and Northern New Guinea respectively. The first two are almost identical and

hibit sexual dimorphism like that of the Australian King, but in *A.c. szkowskii* the sexual dimorphism is less marked and the hens differ from the cocks only in having the mantle and back green instead of blue.

The pair of the nominate race, which had been at the London Zoo for several years, reared one chick in 1952 but it did not survive for long after leaving the nest. They hatched another chick in the following year but did not rear it. At about the same time there was another pair in the collection of Alfred Ezra, who was then President of the Avicultural Society. This pair reared six young during the period 1945-1954. They were seen regularly by the members of the Avicultural Society at the delightful annual garden parties at Foxwarren Park. When Ezra died, they were acquired by Crawford McCullagh with whom they appeared to do poorly for when he died a few years later there was only one female left. This was obtained by Alfredo Marques who also got an unmated male from Gerry Kirkham. The pair produced two young but then the cock died. There appeared to be no chance of replacing the breeding cock but at the London Zoo there was a very scruffy, partly bald, old cock which the curator of Birds, John Yealland, let Alfredo Marques have on loan. Surprisingly, it mated successfully with the hen which hatched four chicks. However, disaster struck when the birds were given chickweed which had been sprayed very recently with toxic weedkiller. All the Green-winged Kings and many other birds died.

As far as I know, these were the last Green-winged Kings of the nominate race in this country. However, about ten years ago several of the race *szkowskii* were imported. They were very difficult to establish being very shy feeders and loath to eat hard, dry seed which is not surprising since, in the wild, they subsist mainly on berries, fruit, nuts and blossom. One East Anglian aviculturist, John Scott, persisted with the species. His efforts were rewarded with success and now he has several breeding pairs. His birds are kept in large, secluded, well-sheltered aviaries and are fed mainly on soaked wheat, berries like elder and hawthorn, fruit and artificial nectar. They have a malevolent look in their eyes which, coupled with their behaviour and slightly serpentine appearance, makes them resemble the Island King Parrots *amboinensis* more than the other Green-winged Kings which are similar to the Australian King. Undoubtedly, like all the members of the genus, they are interesting and exquisitely beautiful subjects for aviculture and one can only hope that an aviary-bred strain will be firmly established before they and their natural habitat disappear forever.

* * *

IMPING: A PRACTICAL METHOD TO REPAIR FEATHERS

By DAVID FRANK

(Curator of Birds, Leeds Castle, Maidstone, Kent)

Imping is a technique that has been used by falconers for centuries to repair the broken or damaged feathers of their hawks and falcons. It is simply the process of glueing in a new feather that has been sheared previously by the same bird or any other individual or species that has similar feathers. It can be a very valuable tool for the aviculturist who requires an immediate return to flight of a bird that has had its wings trimmed.

It is a great pity but often birds are imported which have no specific value to the aviculturist or breeder as they are commonly available, lack brilliant colours, are difficult to care for or may be abundant and difficult to breed. In this situation, the lucky individuals will end up as pets in the home where they are cared for properly and allowed to settle down into a relatively stable environment. Sooner or later these birds are sought out by the aviculturist. Most of us at one time or another have come by a perfect candidate for our breeding programme which, indeed, has been a pet and may have a wing or wings trimmed.

Birds that have been in a stable environment for some time do make excellent breeders. The close proximity to humans in a small, undisturbed territory (their cage) generally produces a very tame personality so vital to captive breeding. If the individual is tame it will display all the necessary behaviour essential for breeding with very little regard for human presence. This type of bird will most certainly make a good breeding bird in a relatively short time.

These pet birds may have been common when they were originally imported and now they may very well be important genetically for the survival of the species, at least in captivity. Quite often these birds will have their wing feathers clipped to prevent the damage that may be done to the home or themselves if they had been allowed to fly. A good situation for the pet owner but not so good for the aviculturist. There is no reason why you must wait a full year for a bird to moult in new feathers. This situation may be repaired quickly, easily and with no pain to the bird.

Falconers fly their birds daily if the bird is not in moult and it is naturally very important to every falconer to have his bird fit and in perfect feather. This definitely is one measure of his ability to care for these birds. Having a bird in feather perfect condition helps to insure

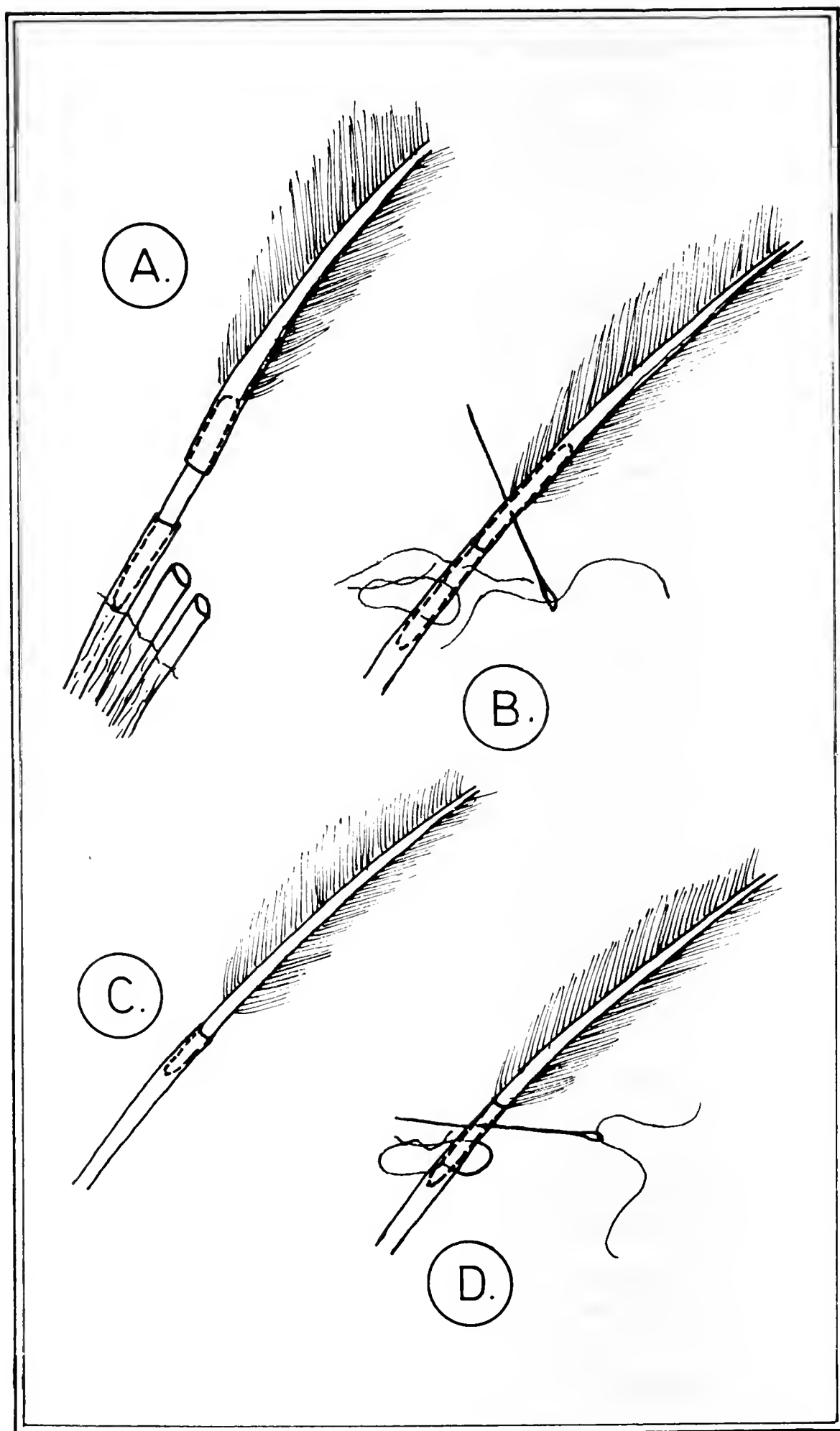
best possible performance in the field from the hawk. Feathers may occasionally be broken while engaging the prey species chosen by the coner but more often than not, it is a product of poor perching or proper handling. This is quite different from the aviculturist's problem where the wing feathers were intentionally trimmed, but the same repair procedure will work.

In order for imping to work correctly, the bird must have the hollow portion of the shaft still in place in the wing. This is the part to which you will be attaching the chosen replacement. It is helpful to have the feathers you plan on using laid out in the order in which they are to be attached to the body to avoid last minute confusion. The bird will be wrapped up in a towel and should only be held in this situation for as short a time as possible. If the procedure does take a long time, the process should be completed in two sessions to keep the stress to a minimum. Perhaps a trial run on a pigeon or chicken to become familiar with the technique might make you more familiar with the process. Be organised and have all materials ready and at hand.

An assistant should hold the bird in a towel with the wing that is to be repaired exposed and accessible. The best place to start is closest to the body. This will make it much easier to trim the feathers in such a way as to follow the natural line of the wing and create a normal flight surface. Re-create the flight surface as accurately as possible so the bird adjusts to this new wing easily. If it is difficult to determine the natural line of the trailing edge of the wing, make the feathers too short rather than on the long side. It must be quite a shock to the bird to be able to fly immediately after this procedure when perhaps it had not flown for many years.

The first replacement feather and shaft in the wing should be trimmed to follow the hollow area so that they line up leaving the tip of the feather following a natural line. Then a small piece of bamboo or other lightweight hardy wood should be trimmed to fit snugly into the replacement feather. Bamboo seems to be the best as it is very flexible and easy to carve. Naturally the cut should be as far away from the body as possible leaving a large base still in the wing from which to attach the feather. Leave this wood inserted in the replacement feather and cut it off at the depth of the hollow base remaining in the bird's wing. Care should be taken not to split the feather shaft as the bamboo splint is inserted. Now whittle down the bamboo carefully so it also fits snugly into the hollow base and the feather should look normal and natural in place with no rough edges where the join is made.

Obviously this will not stay in place by itself so the join should be pulled apart slightly to add a few drops of glue. The best type of glue to



A. Matching feather with bamboo splint in place ready for cementing; B. Thread may be passed through feather after cementing if feather shaft has been split. Use hypodermic needle as a drill between fingers before stitching; C. A smaller feather may not need to be trimmed if the shaft fits snugly into the hollow base; D. When using smaller feather a few stitches are important to keep the feather in place.

(Drawings by Clive Stanton)

is one of the so-called 'super glues'. These are very viscous and will flow into the hollow portion of the feather around the carved wooden joint quite easily. After applying a few drops of glue, push the joint back together quickly and line the tip up with the existing feathers. Take care not to get this glue on the other feathers. In a few moments this will dry and you will be ready for the next feather and so on, out to the tip of the wing.

When the bird is placed in an aviary, you may notice that it has trouble flying. This will more than likely be due to the fact that muscles are out of shape and the individual is not accustomed to the wings actually working correctly. It might be a good idea to add a few extra perches in the aviary. By treating the bird as if the wing were still trimmed, the bird will have sufficient time to learn how to fly again and find those long-lost muscles.

ACKNOWLEDGEMENTS

I would like to thank Clive Stanton (Leeds Castle) for producing the beautiful drawings that accompany this article.

* * *

1988 HIGHLIGHTS AT THE ST LOUIS ZOO

By BRUCE W. BOHMKE

(Curator of Birds, St. Louis Zoological Park, USA)

The 1988 breeding season was very busy with 94 species producing eggs and 226 individual specimens reared. Three species of penguins produced eggs: Adelie *Pygoscelis adeliae*, Rockhopper *Eudyptes crestatus* and King *Aptenodytes patagonica*. Only the King Penguin eggs were fertile and one chick was reared. This is the tenth chick produced in the last ten years.

A total of 42 species of waterfowl laid eggs but unfortunately a large number of eggs were either infertile or died during incubation. Some species which we were particularly pleased to rear included:

Ruddy-headed Goose	<i>Chloephaga rubidiceps</i>
Red-breasted Goose	<i>Branta ruficollis</i>
Puna Teal	<i>Anas versicolor puna</i>
Ruddy Duck	<i>Oxyura jamaicensis jamaicensis</i>
American Goldeneye	<i>Bucephala clangula</i>
White-winged Wood Duck	<i>Cairina scutulata</i>

While two pairs of White-winged Wood Duck are maintained, one hen laid eggs in 1988. Ten eggs hatched and nine young were reared to independence.

The first egg produced by the King Vultures *Sarcorhamphus p* was pulled for artificial incubation. This egg hatched and the chick successfully hand-reared. A second fertile egg was produced and pulled for artificial incubation with a dummy egg given to the parents. In 1988 a chick introduced to the parents shortly after hatching had been killed by the male. The female had shown good maternal behaviour. When the second egg hatched the male was separated from the female and the chick was introduced to the nest. The female fed and brooded the chick and became quite protective of the nest. The second chick was successfully reared but the male was never able to be reintroduced to the female until the chick had been removed.

The Bateleur Eagles *Terathopius ecaudatus* laid three fertile eggs, two of which were removed for artificial incubation. While three eggs had been laid in one season before, this is the first time all three eggs had been fertile. The first egg hatched but the chick succumbed to enteritis at one week. The second chick was in an inverted position in the egg and had to be assisted out. Despite a difficult start, this chick was reared with little difficulty. The chick inside the third egg died at 55 days without pipping.

A number of pigeon species were reared including:

Pied Imperial Pigeon	<i>Ducula bicolor</i>
Bleeding Heart Dove	<i>Gallicolumba luzonica</i>
Victoria Crowned Pigeon	<i>Goura victoria</i>
Black-naped Fruit Dove	<i>Ptilinopus melanospila</i>
Pink-necked Fruit Dove	<i>P. porphyrea</i>

The Victoria Crowned Pigeon was hand-reared after the male died during incubation and the female abandoned the nest. Both species of fruit dove proved to be very good parents and prolific breeders. In most cases, within a few weeks after fledging a chick, the female laid another egg often while the male was still feeding the previous offspring.

Other species which reared offspring in 1988 included:

White-headed Buffalo Weaver	<i>Dinemellia dinemelli</i>
Magpie Robin	<i>Copsychus saularis</i>
Micronesian Kingfisher	<i>Halcyon cinnamomina</i>
Mottled Owl	<i>Ciccaba virgata</i>
Small-billed Tinamou	<i>Crypturellus parvirostris</i>
Red-faced Mousebird	<i>Colius indicus</i>

All of these species are the focus of a long term breeding effort at the St. Louis Zoo. This type of commitment generally implies maintaining multiple breeding pairs and participating in relevant breeding programmes.

By JEFFERY BOSWALL
(Bristol)

In February 1988, I travelled in China from Beijing (Peking) in the north to Shenzhen (next to Hong Kong) in the south and visited zoos in Xi'an (Sian), Nanjing (Nanking) and Nanchang.

The last-named city had the smallest zoo and a near-complete census was possible. Time at the other two zoos was limited and counting was limited to the larger birds.

In the tables the birds are in systematic order and the common and scientific names follow de Schauensee (1984).

Xi'an Zoo

A spacious, reasonably modern zoo with a series of terraced ornamental lakes.

Nanjing Zoo

This establishment is situated on one of several islands in a large lake in a large city park. It is a fraction old-fashioned.

Nanchang Zoo

A small zoo in a smallish city park. The waterfowl and cranes appeared to be in very good condition.



Mrs. Lee Algar

Full-winged adult Siberian Crane *Grus leucogeranus* in Nanchang Zoo, February 1988. In the background, from left to right: a Common Crane *G. grus*, a White-necked Crane *G. vipio* and an Oriental White Stork *Ciconia c. boyciana*.

TABLE 1: CHINESE BIRDS IN THREE CHINESE ZOOS

Common Name	Scientific Name	Xi'an Zoo 21st February 1988	Nanjing Zoo 22nd February 1988	Nanchang Zoo 27th February 1988
Cattle Egret	<i>Bubulcus ibis</i>	-	-	1
Chinese Pond Heron	<i>Ardeola bacchus</i>	-	-	1
Little Egret	<i>Egretta garzetta</i>	-	-	6
Grey Heron	<i>Ardea cinerea</i>	-	1	3
Oriental White Stork	<i>Ciconia boyciana</i>	4	1	6
Whooper Swan	<i>Cygnus cygnus</i>	24	6	5
Bewick's Swan	<i>Cygnus columbianus</i>	1 (of eastern race - <i>jankowskii</i>)	-	-
Swan Goose	<i>Anser cygnoides</i>	4	4 (+1 domestic form)	2
Greylag Goose	<i>Anser anser</i>	4 (of eastern race - <i>rubrirostris</i>)	-	-
Greater White-fronted Goose	<i>Anser albifrons</i>	3	-	16
Bean Goose	<i>Anser fabalis</i>	3	-	-
Bar-headed Goose	<i>Anser indicus</i>	2	9	3
Ruddy Shelduck	<i>Tadorna ferruginea</i>	2	16	12
Common Shelduck	<i>Tadorna tadorna</i>	-	2	2
Spot-billed Duck	<i>Anas poecilorhyncha</i>	-	40	-
Mallard	<i>Anas platyrhynchos</i>	Present (no count)	10 pairs	8 drakes
Common Teal	<i>Anas crecca</i>	"	6 drakes	-
Falcated Teal	<i>Anas falcata</i>	2 pairs	2 pairs	-
Wigeon	<i>Anas penelope</i>	Present (no count)	2 pairs	-
Common Pintail	<i>Anas acuta</i>	"	-	2 drakes
Garganey	<i>Anas querquedula</i>	1 pair	1 pair	1 drake
Common Pochard	<i>Aythya ferina</i>	-	-	2 pairs
Baer's Pochard	<i>Aythya baeri</i>	-	1	-
Mandarin Duck	<i>Aix galericulata</i>	c. 30	40 pairs	c. 60 pairs

Vulture		-	3	-
Tawny Eagle (probable)	<i>Aquila rapax</i>	2	-	-
Golden Eagle	<i>Aquila chrysaetos</i>	3	-	-
Chinese Bamboo Partridge	<i>Bambusicola thoracica</i>	-	-	1 pair
Temminck's Tragopan	<i>Tragopan temminckii</i>	-	2 pairs	-
Koklass Pheasant	<i>Pucrasia macrolopha</i>	-	1 pair	-
Silver Pheasant	<i>Lophura nymthemera</i>	-	1m + 3f of one race; 1 pr. of different race	3 (2m, 1f)
Blue Eared Pheasant	<i>Crossoptilon auritum</i>	9 males, some females	-	-
Brown Eared Pheasant	<i>Crossoptilon mantchuricum</i>	3 m, some females	3 (2m, 1f)	-
Common Pheasant	<i>Phasianus colchicus</i>	2, + 4 m of very green race	-	-
Golden Pheasant	<i>Chrysolophus pictus</i>	45 (18m, 27f)	7 (3m, 4f)	1 m
Lady Amherst's Pheasant	<i>Chrysolophus amherstiae</i>	-	1 pair	-
Common Crane	<i>Grus grus</i>	4	2	6
Japanese (Red-crowned) Crane	<i>Grus japonensis</i>	3	3	3
Hooded Crane	<i>Grus monacha</i>	1	1	1
White-necked Crane	<i>Grus vipio</i>	5	5	3
Siberian Crane	<i>Grus leucogeranus</i>	-	-	1
Demoiselle Crane	<i>Anthropoides virgo</i>	5	1	-
Great Bustard	<i>Otis tarda</i>	3	-	-
Common Coot	<i>Fulica atra</i>	c. 5	-	-
Great Black-headed Gull	<i>Larus ichthyæetus</i>	1	1	-
Common Black-headed Gull	<i>Larus ridibundus</i>	3	2	-
Herring Gull	<i>Larus argentatus</i>	2	1	-
Spotted Dove	<i>Streptopelia chinensis</i>	-	-	3
Lord Derby's Parrakeet	<i>Psittacula derbiana</i>	-	3	3
Eagle Owl	<i>Bubo bubo</i>	-	2	-

Tawny Fish Owl	<i>Ketupa flavipes</i>	-	-	1
Bohemian Waxwing	<i>Bombycilla garrulus</i>	-	1	-
Blue Whistling Thrush	<i>Myiophonus caeruleus</i>	-	-	1 (of dark-billed race)
Pale Thrush	<i>Turdus pallidus</i>	1 probable	2	-
Common Blackbird	<i>Turdus merula</i>	-	1	-
Hwamei (Brown Laughing-thrush)	<i>Garrulax canorus</i>	-	30-40	-
Black-faced Laughing Thrush	<i>Garrulax affinis</i>	-	-	1
Brambling	<i>Fringilla montifringilla</i>	-	c.20	2
Yellow-billed Hawfinch	<i>Coccothraustes migratorius</i>	-	20	-
Crested Myna	<i>Acridotheres grandis</i>	-	3	-
Hill Myna	<i>Gracula religiosa</i>	-	5	-
Eurasian Magpie	<i>Pica pica</i>	-	1	-

TABLE 2: EXOTIC BIRDS IN THREE CHINESE ZOOS

Common Name	Scientific Name	Xi'an Zoo 21st February 1988	Nanjing Zoo 22nd February 1988	Nanchang Zoo 27th February 1988
Ostrich	<i>Struthio camelus</i>	Present (no count)	-	-
Lesser Rhea	<i>Pterocnemia pennata</i>	-	1	-
Emu	<i>Dromaius novaehollandiae</i>	-	4	-
Chilean Flamingo	<i>Phoenicopterus chilensis</i>	Present (no count)	-	-
Black Swan	<i>Cygnus atratus</i>	" "	-	4
Black-necked Swan	<i>Cygnus melanocoryphus</i>	" "	-	-
Common Peafowl	<i>Pavo cristatus</i>	" "	15	2
Helmet Guineafowl	<i>Numida meleagris</i>	-	-	2
Sudanese Crowned Crane	<i>Balearica pavonina ceciliae</i>	-	1	-
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	-	1	-
Budgerigar	<i>Melospiza melanogaster</i>	-	10	15

Note: In the case of Nanchang Zoo, many waterbirds were unpinioned and kept in flight cages. Otherwise waterbirds were occupying ornamental lakes and most appeared to be pinioned. So far as I am aware, or could be certain, all birds in unenclosed areas were captive, but there could have been an admixture of wild individuals.

The ration of indigenous to exotic birds

As shown for Chengdu (Chengtu) Zoo by Boswall (1986), these three zoos' avian populations were also dominated by Chinese species. If we set aside the Xi'an data, because a number of bird houses were not visited, and use the censuses at the other two zoos, then we find that at Nanjing, of 49 species, 43 (88%) were Chinese. Comparable figures for Nanchang are: 40 species in all, of which 32 (80%) are Chinese.

Endangered birds

All three zoos held birds listed by King (1978-79) in the ICBP/IUCN Red Data Book for China.

Of the Oriental race of the White Stork *Ciconia ciconia* (regarded by Schauensee as a full species, the Oriental White Stork *C. boyciana*),

a total of 11 were in captivity. This form, *boyciana*, is rare. It nests in the Soviet Far East and in north-east China. Probably only a few thousand birds exist in the wild. Regarded as endangered.

One zoo had one White-tailed Eagle *Haliaeetus albicilla*. Regarded as vulnerable. This species has a very wide distribution in Eurasia.

Two zoos had at least six Brown Eared Pheasants *Crossoptilon mantchuricum*. Regarded as endangered, and clearly rightly so as this species, in the wild, is globally confined to three reserves in Shanxi province in China (Kind, 1986).

All three zoos had captive Japanese (Red-crowned) Cranes *Grus japonensis*, nine in all. This species is regarded as vulnerable. It breeds in the USSR, in Japan and in China.

Again in each of the establishments there were Hooded Cranes *G. monacha*, though fewer, the total being only three birds, one at each zoo. Regarded as vulnerable. The Hooded Crane nests only in China and the USSR.

All three zoos also held White-necked Cranes *G. vipio*, the total being 3 birds. Regarded as vulnerable. It nests only in China and the USSR.

Unsurprisingly, only one zoo had a captive Siberian Crane *G. leucoramus*. A fine-looking individual at Nanchang Zoo appeared to be capable of flight. Regarded as endangered, since less than 2,000 birds are left in the wild. Most winter in China. The bird breeds in the USSR, but may

still do so in the north of China where it was formerly known so to do.

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FURTHER NOTES ON FERAL ROSE-RINGED PARRAKEETS

Psittacula krameri

IN KENT

BY DEREK GOODWIN

(Petts Wood, Kent)

Members might be interested in the latest news of the local Rose-ringed Parrakeets, of which I wrote in our Magazine in 1983 (Vol. 89: 84-93) and more briefly in 1987 (Vol. 93: 235-236).

In 1988 at least three pairs nested and I think that young fledged from two nests but am not absolutely certain of this as I was away at the time that the actual fledging apparently took place.

At the third nest the pair behaved as though young had been removed from or died in the nest though there was nothing to suggest human predation.

In November and December I heard and saw the birds seldom and never more than three, but in the past ten days the usual late winter visiting of old, and prospecting of new nest sites has started. I think there are about nine or ten birds in all, possibly more, although I have not had more than seven in sight at any one time.

Yesterday, when with a friend looking for the Parrakeets in a small wood where two pairs nested last year in adjacent dead Alder stumps (in very old woodpecker holes), we soon located five birds and with them, to our surprise, was an Alexandrine Parrakeet *Psittacula eupatria*.

Although associating with the Rose-rings to some extent, it tended often to fly, calling loudly, and to perch by itself. Once it showed great interest in an old Green Woodpecker hole high in a tree, clinging and looking in several times, then entering and spending some minutes in

the hole, frequently looking out, before coming out and flying off.

About 20 minutes later what was almost certainly the same bird (was either a hen or an immature cock) was in the old 'field Ash' about half a mile away. A pair of Rose-rings was also there; one of them was attacked by, and had feathers torn from its body by a Starling, when it tried to investigate the hole in which, in bygone years, Rose-ringed Parrakeets nested yearly with no apparent success.

After a few minutes the Alexandrine took wing and, calling at intervals, flew back toward, and then into the wood where we had first seen

Although, 'in the field' the size difference between the two species was not very obvious and the carmine shoulder patches only evident when very close views were obtained, the heavier build and much larger bill of the Alexandrine was immediately noticeable in flight, even when it was only seen flying from tree to tree within the wood. When I saw it in open flight the wing beats appeared slower and the wings to beat through a wider arc than those of the Rose-ringed Parrakeet.

Since it is unlikely that another Alexandrine of opposite sex will escape and turn up here, I fear this bird is going to be frustrated in its obvious desire to breed. I hope indeed that it will not interfere with the nesting of the Rose-rings.

Though I have, of course, seen the Alexandrine before in captivity, I have never before seen one flying free and this was a new experience and a sight for me. All the same, imposing though the bird is, I do not think it is as beautiful as the more dainty and elegant Rose-winged Parrakeet.

I must sadly add that, unless the young birds disperse to other places, the yearly breeding of our local Rose-ringed Parrakeets does not even compensate for yearly losses as there are, I think, only about half to two-thirds the number that there were ten years ago.

Footnote: The Alexandrine has been seen several times since, the last by me on 14th February 1989, when she was clearly paired to a cock Rose-ringed. Despite what I have said above, when the two were perched side by side, the size difference was at once evident.

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COMMENTS ON THE EGGS, NATAL DOWN AND PLUMAGE OF SOME PARROT SPECIES

By TONY SILVA
(North Riverside, Illinois, USA)

Every year countless parrots, common and rare, are bred in confinement. Aviculturists as a whole take it for granted that someone has recorded the down colour of the young, size of the eggs, or even sexual dimorphism evident in live birds but not in taxonomic skins. In most cases, such information would be useful to biologists and ornithologists, and here some of these data are presented.

CITRON-CRESTED COCKATOO *Cacatua sulphurea citrino-cristata*

Although bred as long ago as 1956, no one has made mention of the deeper yellow and thicker natal down in this subspecies when compared to *sulphurea* or other 'yellow-crested' subspecies. There is also a major difference between *sulphurea* and *citrino-cristata*; the bill of immature *sulphurea* is whitish coloured until the bird is about seven months old, whereas it turns black in the Citron-crested at about three or four weeks old. The legs are mottled grey and flesh coloured until approximately the same time that the bill changes in *sulphurea* but in *citrino-cristata* this is black before the fourth week. Citron-crested Cockatoo chicks develop faster, and this, along with the aforementioned characteristics as well as conspicuous behavioural differences, seems to indicate that *citrino-cristata* deserves specific rank.

Eggs of Citron-crested Cockatoos measure 42.3 x 28.7, 45.0 x 31.5mm.

MOLUCCAN OR SALMON-CRESTED COCKATOO *C. moluccensis*

In this majestic species, as in other white cockatoos (except *C. leucorhynchos beateri*), the skin surrounding the bill is white, starting to turn grey between four and six months old. In *moluccensis* the orbital ring is cream coloured until about a year old. Interestingly, infertility appears very high in captivity when compared to other cockatoos, increasing if after every clutch the male is withdrawn and a second used in its place.

Eggs measure 43.6 x 30.5, 44.7 x 32.4 and 45.4 x 33.9mm.

SULPHUR-CRESTED COCKATOO *C. galerita eleonora*

The only egg measured was 43.9 x 30.7mm.

GOFFIN'S COCKATOO *C. goffini*

In this generally hyperactive cockatoo, the chicks are thinly downed

colour being pale yellow; their crop is the smallest of any *Cacatua* and the dark patches give the appearance of being macrocephalic.

Two eggs measured averaged 37.3 x 28.1mm.

VASA PARROT AND BLACK PARROT *Coracopsis vasa* and *C. nigra*

These unusually coloured parrots undergo a conspicuous transformation at the onset of the breeding season: the plumage of the male darkens; the cere and bill of both sexes turn horn-coloured (from greyish-black), the male in particular begins to call in a most distinct manner and the male's vent drops, sometimes with semen flowing freely.

GREY PARROT *Psittacus erithacus timneh*

Immatures have tail feathers reddish near the base, brownish towards the edge.

A single, elliptical-ovate egg measures 38.8 x 28.1mm.

HYACINTHINE MACAW *Anodorhynchus hyacinthinus*

Mature, near-breeding adults acquire orangish tinge to orbital ring. Tip of mandible is horn-coloured in young birds, and the orbital ring, mandibular patch and stripe down the sides of the tongue are cream-coloured - not yellow, as in adults.

LEAR'S MACAW *Anodorhynchus leari*

Immatures show characteristics similar to *A. hyacinthinus*.

A single egg laid in captivity measures 46.1 x 35.0mm; it has been deposited in the collection of the Field Museum of Natural History, Chicago.

SPIX'S MACAW *Cyanopsitta spixii*.

Immatures have grey irises.

BLUE AND YELLOW MACAW *Ara ararauna*

Very commonly bred, and has hybridised with all the large *Ara* macaws to the Hyacinthine. The resulting progeny are fertile.

Eggs measure 40.3 x 33.4, 43.0 x 35.5, 41.4 x 32.3, 45.3 x 34.3, 45.9 x 35.1, 42.9 x 34.4 and 45.2 x 32.8mm.

BLUE-THROATED MACAW *A. glaucogularis* is, in my opinion, a valid species, being very distinct in call and behaviour. Immatures resemble adults but for the grey iris.

MILITARY MACAW *A. militaris*

Authors have tended to discount the validity of the subspecies *mexicana* and *boliviana*. If seen alive, however, their views would alter; there is no doubt that all subspecies are indeed valid.

SCARLET MACAW *Ara macao*

Aviculturists are well aware of geographic variations in size, color and personality: birds from Mexico have a greater amount of yellow wings and the nape feathers are yellowish tinged. Central American specimens are larger, deeper coloured and with milder temperaments (Scarlet Macaws are known for biting without warning) and individuals from Bolivia have especially long tail feathers and less yellow on wings.

GREEN-WINGED MACAW *Ara chloroptera*

Eggs measure 32.0 x 26.0, 49.0 x 35.3 and 48.9 x 36.0mm.

RED-FRONTED MACAW *A. rubrogenys*

Behaviour is very conure-like. Underparts strongly tinted in orange.

CHESTNUT-FRONTED MACAW *A. severa*

Immatures are similar to adults but with iris grey.

RED-BELLIED MACAW *Ara manilata*.

Immatures have culmen white.

RED-SHOULDERED MACAW *A. nobilis*.

These small macaws are very conure-like, indeed, hybrids have been produced with the Mitred Conure *Aratinga mitrata*

GOLDEN CONURE *Aratinga guarouba*.

As with the Blue-crowned Conure *A. acuticaudata*, this species is decidedly unconure-like: the Golden breeds colonially in the wild and Blue-crowned nestlings develop similarly to those of the Red-shouldered Macaw.

Eggs of *guarouba* measure 32.9 x 30.2, 37.0 x 29.7, 36.1 x 28.7 and 35.4 x 28.9mm.

FINSCH'S CONURE *Aratinga finschi*

Eggs measure 29.9 x 24.9, 29.0 x 24.3, 29.1 x 24.5 and 30.1 x 25.0mm.

HISPANIOLAN CONURE *A. chloroptera*

Eggs measure 29.1 x 22.9, 29.3 x 21.5, 33.1 x 21.8, 35.0 x 29.8 and 35.5 x 28.7mm.

SUN CONURE *Aratinga solstitialis*

Very prolific, one aviary alone rears some 300 annually.

Eggs measure 26.8 x 22.3, 27.4 x 23.7, 26.2 x 23.0, 29.0 x 23.0, 28.0 x 24.2, 26.2 x 22.4, 28.0 x 23.4, 28.1 x 23.9 and 28.2 x 24.2mm.

ST THOMAS (CURAÇAO OR CARIBBEAN) CONURE *A.p. pertinax*

Eggs measure 28.2 x 23.4, 28.1 x 23.9 and 28.2 x 24.2mm.

AZARA'S CONURE *Pyrrhura frontalis chiripepe*

Eggs measure 26.5 x 20.7 and 28.0 x 20.9mm.

WHITE-BELLIED CAIQUE *Pionites leucogaster*

Orbital ring can be flesh or black-coloured depending on distribution.

ROSE-FACED PARROT *Pionopsitta pulchra*

Blue iris colour is unique amongst parrots.

BRONZE-WINGED PARROT *Pionus chalcopterus*

Orbital ring becomes pinker as the breeding season approaches; colours intensify noticeably at this time.

Eggs measure 33.9 x 25.3 and 33.7 x 25.0mm.

CUBAN AMAZON PARROT *Amazona leucocephala*.

All subspecies are valid, the diagnostic features being very evident in young birds.

RED-SPECTACLED AMAZON PARROT *A. pretrei*

Sexually dimorphic; the male has more red on head and wings. Its bill is more outward protruding than in the Tucuman Amazon *A. tucumana*.

RED-LORED AMAZON PARROT *A. autumnalis diadema*

Most conspicuous feature is the densely feathered nostrils, reminiscent of those in the Military Macaw *Ara militaris*. Could be confused with Olivin's Amazon Parrot *A. a. salvini* when immature. Mexican *autumnalis* has considerable orange on cheeks and lores, and where this subspecies and *salvini* integrate in Nicaragua, the birds resemble *salvini* but with some yellow cheek and lore feathers.

RED-TAILED AMAZON PARROT *A. brasiliensis*

This species is very similar to the Festive Amazon *A. festiva bodini* in the appearance of the head; the two could probably not be separated except by the most astute observers.

YELLOW-FACED AMAZON PARROT *A. xanthops*.

This species is unquestionably not an *Amazona*; its chromosome composition resembles no other member of the genus that it is currently assigned to. It may well show closer affinity to the Short-tailed Parrot

Graydidascalus brachyurus. The cere is swollen and pink, bill often has sides overgrown to form points (this could be described as giving the tip of the upper mandible a 'square' look), and aggression is inordinate. High, indeed, fights erupt without the slightest provocation and if unattended, would doubtless result in deaths. There appear to be two types, the larger, mainly all green variety, and the more colourful, smaller type. Both are depicted in *Parrots of the World* by J.M. Forshaw, the former being incorrectly labelled 'immature'. In the more colourful type, one occasionally finds females with colour that approximates that of males, otherwise sexual dimorphism is conspicuous; this also applies to the green variety. Legs are flesh to yellowish-coloured, and the nails are black.

BLUE-FRONTED AMAZON PARROT *A.a. aestiva*

Mature males have throat feathers tinged in red, and both sexes have solidly red wing butts - not yellow and red as is often stated in the literature.

YELLOW-WINGED AMAZON PARROT *A.a. xanthopteryx*

There is considerable variation in colour and size. When one has field experience with this ubiquitous parrot, it is possible to notice geographical differences. Birds from Paraguay are smaller and duller than those found in the Argentine province of Chaco, which are larger, have more yellow on head and wings, longer tails and lighter underparts.

YELLOW-CROWNED AMAZON PARROT *A. ochrocephala xantholaema*.

This subspecies is valid, with several live individuals being held by aviculturists in Brazil and Europe, particularly Holland. Occurs solely on Marajo Island where it is not uncommon (pers. obs. 1987). It is a large bird (usually over 500g) which could easily be confused with *A.a. aestiva*, but the invariable presence of green on the forehead, sometimes more extensive yellow on head (in adult males it can reach the nape) and pinkish sides of upper mandible are diagnostic.

A.o. magna. This subspecies should be resurrected. Birds held in aviculture and known to be *magna* are larger and more colourful than the Double Yellow-headed Amazon Parrot *A.o. oratrix* from Mexico. Moreover, males also show orange-coloured nape feathers.

HÜHNERVÖGEL DER WELT

By H.S. Raethel. Published by Neumann-Neudamm, Melsungen, Germany 1988. Price DM 198.

This splendid book deals with all the gamebirds of the world - curassows, guinea fowls, chachalacas, turkeys, grouse, partridges, quail, pheasants, junglefowl, peafowl, megapodes, brush turkeys and their allies.

It has been written with the aviculturist much in mind and starts off with chapters on the general care and breeding of gamebirds in captivity. Then follows the bulk of the book in which there is an introduction to each family or, depending on the number of species involved, each group of related species within a family. This is followed by accounts of the component species. These include description (including those of geographical races and colour mutations), distribution, habitat, ecology and behaviour and, where known, the species' history and needs in captivity.

In the general introductory section the author appears dismissive of other feeding methods. Offering a choice of grains, greenfood, fruit, egg, etc., is said to be, in effect, offering a 'calorie bomb' to the birds, and the use of 'modern' and 'scientific' poultry foods is recommended. On the other hand, in the species sections, the accounts of and implied advice on feeding is often of a more old fashioned kind.

Having myself only kept three easy species - Golden and Common Pheasants and Red-legged Partridge - and that in the now distant past, I have little basis for comment. I must say, however, that without exception all the commercially kept poultry I have seen, or seen photographs of, have been in deplorable condition, though whether this was in part due to the use of, or because of the modern scientific foods on which they were fed, I do not know.

The species accounts are comprehensive, well written and fully referenced. (I was glad to see several references to articles that have appeared in our magazine.) They contain a wealth of information on behaviour in which I feel sure most of us will be able to learn many facts we did not know before. For example, that Ptarmigan *Lagopus mutus* dustbathe in snow and that their chicks must have a real live parent or parent substitute and cannot be reared with only an artificial source of warmth.

There are numerous good black and white illustrations and, unless I have miscounted, 292 colour photographs. Most of these colour photographs are excellent and with good colour reproduction. Many of them are also of great interest, for example, the Mallee Fowl testing the temperature of its incubator while its mate stands nearby (p. 752), the pair Celebes Maleos on their nest mound and many of various pheasants playing. The colour photos also show many species of which I have

never seen any published photographs before.

At 198 DM this may seem an expensive book but to anyone who is interested in gamebirds (except those who merely wish to kill them for fun) and can read German it is worth every penny. Indeed anyone who can afford to do so, even if he or she cannot read German, will find the book well worth buying for the pictures alone. I can recommend it unreservedly.

D.C.

* * *

NEWS AND VIEWS

Andrew Owen writes from Lower Basildon:

'An interesting and informative article by Professor Paul Roth concerning the plight of the Hyacinthine Macaw *Anodorhynchus hyacinthinus* in the wild is featured in a recent *American Cage-Bird Magazine*. This well-known bird is drastically declining throughout much of its range, the main reason being thought to be the capture of birds for the pet trade. Professor Roth states that there are probably more Hyacinthine Macaws in captivity than are now left in the wild, with an estimated wild population of only 3,000 to 4,000 individuals. The recent removal of this species from CITES appendix 2 to appendix 1 will, it is hoped, restrict further trade in this macaw. Once again aviculturists have a chance to prove their worth by making every effort to breed this magnificent species.

'A pair of Mauritius Parrakeets *Psittacula echo* have successfully hatched in the wild. This is the first known breeding of this highly endangered parrakeet for several years. With an estimated wild population of only eight birds, this is the world's rarest parrot. The nest was discovered by a Mauritian field researcher, Stephen Roult, working with the Mauritius Wildlife Appeal Fund. After a 24-hour watch on the nest revealed that the chicks were probably not receiving enough food, they were taken into captivity and successfully fostered by a pair of Ring-necked Parrakeets *Psittacula krameri*.'

* * *

Mats Tell writes from Sweden about his 1988 breeding results:

'Thanks to the unusually mild winter of 1987/88, followed by a warm and sunny spring, most of my birds came into full breeding condition.'

ion in April. Out of 19 species, two did not make any attempts to breed (Painted Bunting and Taha Bishop), five went to nest without success (Swift Parrots, Eclectus Parrots, Lesser Parrot-billed Seedeater, Urban Finch and Chestnut Sparrow) and 12 were successful. The following young were reared: Bourke's Parrot 11, Turquoise Parrot 3, Silver-red Mesia 2 (5th generation), Red-legged Honeycreeper 1, Parrot-billed Seedeater 3, Crimson-crowned Bishop 1, Little Masked Weaver 4, Red Avadavat 1, Orange-breasted Waxbill 7, Pearl-headed Silverbill 2, Orange-cheeked Waxbill 3 and Jacarini Finch 4.

'Notable breedings in Sweden this year include Yellow-shouldered Flycatcher, Black-winged Starling, Parrot-billed Bulbul, Diuca Finch, Vinaceous and Finsch's Amazons, Hume's Pheasant and Satyr Tragopan.'

* * *

Rosemary Low writes from Tenerife about a little known *Eos* Lory. 'In late 1987 some *Eos* lorries were imported into the UK which were not readily identifiable but some aviculturists believed they belonged to the race *wallacei* which is not accepted by most taxonomists. In *Lories and Lorikeets* I described this race, also a living bird which closely resembled it. It was not until mid-1988, when Loro Parque in Tenerife received four specimens of the mysterious *Eos* that I had the opportunity to see it. It bears no resemblance to the '*wallacei*' that I saw - a much larger bird.

It is the smallest *Eos*, about the size of a Perfect Lorikeet *Trichoglossus* *velox* and the head and upper breast are entirely red except for a few mottled greyish-mauve feathers around the neck. In my opinion this is *Eos squamata obiensis* from the island of Obi. I have not had the opportunity to examine any skins - but *obiensis* has two features not shared by any other race: its very small size and its black scapulars (feathers on the upper part of the wing).

'If one reads Forshaw's descriptions of the races of *squamata* in *Parrots of the World* the same conclusion may not be reached because the variation of the head coloration is not emphasised. G.F. Mees (1965. The Avifauna of Misool. *Nova Guinea Zoology*, Vol. 31: 161) makes this description much clearer. He states of *obiensis*: "Characterized by the black scapulars. Development of the violet-grey collar is extremely variable; in some specimens it is practically absent, in one it is present, but incomplete, in one it is well developed and broad, while in addition a dark crown patch is present. Wing measurements male 134, 140, female immature 135, 143, 143mm."'

* * *

News of an almost certain British first breeding comes from Trevor Skellern, of Amesbury, Wiltshire, who, during the latter half of 1988, suc-

cessfully reared a Red-flanked Lorikeet *Charmosyna placentis*. At the time of writing (February 1989) it was undergoing its first moult. We look forward to reading a full account of this breeding from Mr. Buckell in a future issue.

* * *

The World Pheasant Association has been working for almost ten years now on the reintroduction of the endangered Cheer Pheasant into the Margalla Hills range near Islamabad, Pakistan. Birds from the release are known to have survived for in excess of 20 months giving rise to hope that they can be re-established from captive stock in this and other areas. A further 200 poults have been reared and released in 1988.

Encouraged by this success, attention is now being turned to other parts of the bird's former range and in particular the area north of Balakot at the lower end of the Kaghan Valley. This area has been extensively replanted with Chir pine over the past 10 years and now, once more, provides much ideal habitat.

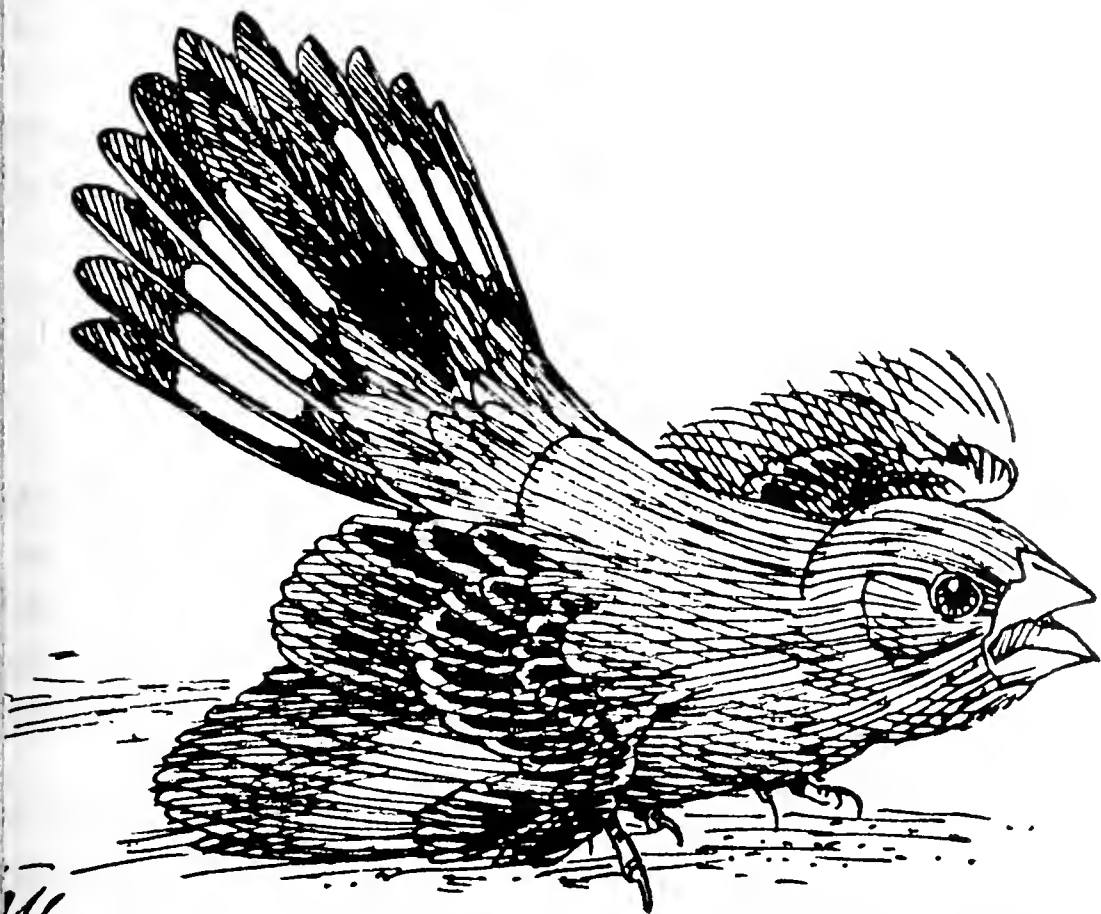
The North West Frontier Province has a sizeable and well set up captive breeding centre at Dhodial - north of Abbottabad, and the first phase of this new project is to establish a captive flock from which young can be hatched and reared for release.

The World Pheasant Association, with help from Marwell Zoological Park in rearing the birds, and assistance from British Airways Assisted Nature Conservation scheme have shipped out nearly thirty birds to start the foundation breeding flock.

* * *

CORRESPONDENCE

Information needed on the Band-tailed Seedeater (*Catamenia analis*)



♂ Band-tailed Seedeater, *Catamenia analis*.

One South American seed-eater that is very rarely available, and has been mis-identified when it has appeared on the market, is the Band-tailed Seedeater from Colombia and Peru. I have only been able to find one male of the species, and thus have been deprived of the opportunity to observe any of the behaviour of an inter-acting male and female. To my delight, I received a letter from Ian Wainhouse of Summerbridge, who is most fortunate to own a pair of these birds. In his letter Ian described the courtship display of the male.

In my experience with the species the male has a pleasant song, but I decided to keep a written description. Ian Wainhouse's notes include, '..... song is sort of three chirps and a *burr*, his display is on the ground, head down, wings outstretched, tail up and spread, all the while croaking like a frog'. To my knowledge, the display ...any display....of this species has not been described. Therefore I replied with a sketch of how I imagined the bird to posture, and the sketch with this letter is the version that has been corrected and agreed by Ian.

I have noticed my male *Sporophilas* (several species) singing and displaying to their females with wings drooped or spread, tails fanned. But

these displays have always been arboreal, from branch to branch, with the males in pursuit of the females. The white patches on the primaries of male *Sporophila* show well in these circumstances, as they do on the male *Catamenia*. What may be of interest in comparing these two apparently closely related genera is that the *Sporophila* do not have white in the tail, whereas this particular *Catamenia* has large white patches on the inner webs of the outer five rectrices.

May I ask any readers who have any knowledge of the *Catamenia*, however slight, to kindly send their notes to the Editor for publication. Any comments on the display described above will be most welcome.

Robin Restall, London

* * *

Mistaken or Multiple Identity?

With reference to Robin Restall's article (Vo. 94:216) on the mistaken identity of birds, I feel that one aspect of avian identification was not covered, namely the multiplicity of scientific names given to certain species. This is the situation that arises where the scientific name quoted for a particular bird may vary according to whatever source documented for the name has been used.

An example of this was highlighted by Jeffrey Trollope in the same issue, in his article on the breeding of the Blue and White Flycatcher. This bird is given variously as *Cyanoptila cyanomelaena*, *Ficedula cyanomelana* or *Muscicapa cyanomelana* depending on the source documented chosen and, as he rightly points out, no authoritative list exists. This is of little or no use to the aviculturist who may be unaware of the different scientific 'aliases' a bird may have, and also is of limited value if he does not have access to a comprehensive library.

Other examples abound: for instance the Zebra Finch *Poephila guttata* is still often quoted as *Taeniopygia castanotis* and occasionally as *Amadina castanotis* and thus even for species as common and easily identified as the Zebra Finch there still appears to be some confusion. To add to this, there is the fact that there has been a great increase in the number of color mutations, etc., available in a number of species in the past few years.

May I suggest that we consider quoting the naming authority after scientific names where there is a possibility of a duality or multiplicity of names. Further, ought we to take a leaf out of the horticulturist's book and describe mutations, etc. by a variety name? This extension need not necessarily be of a Greek or Latin root but simply an accepted mutation name.

Daniel Shearing, Cheddar, Somerset

VICTORIA HORSWELL - AN APPRECIATION

Members will have been very saddened to learn of the death of Victoria (ig) Horswell, from cancer on 21st February 1989, at the tragically young age of 37. The President sent a wreath to the funeral on behalf of members of the Avicultural Society.

From 1971, when her father became Honorary Secretary and Treasurer of the Society, Victoria was always a very willing and helpful supporter. She was in charge of the catering at every social meeting and took great trouble with the suppers at Burlington House and Sladmore Gallery in London, and in recent years the buffet lunches held at Ascot and then Cartley Wintney. Members who attended any of these events will remember her cheerful smile and friendly welcome. Probably less known to most members was Victoria's role in the day-to-day running of the Society, such as helping to pack and deliver all the Magazines to the Post Office, making frequent trips to the bank to pay in subscriptions and numerous other tasks.

In her own life, Victoria was well known in the horse world. In her teens, with her sister and two brothers, she won the national junior and then senior Pony Club Polo Tournament and later organised her father's high goal Sladmore Team. In more recent years she ran the large Pony Club Tournament at Windsor and taught pony clubs as well as hosting their camps.

Victoria was also recognised internationally as a leading expert on animal sculpture, particularly that of the French 19th century Animalier artists. Her own passion was for bird bronzes and she gathered a very fine collection of these which she showed to members at a meeting some years ago.

I am sure I speak for all members of the Society, in offering our deep sympathy to the Horswell family in their great loss.

Professor J.R. Hodges, Chairman of Council.

* * *

AVICULTURAL SOCIETY NEWS

A very successful spring social meeting was held on Saturday, 18th March, at the Society's headquarters at Hartley Wintney. Over 60 members and their guests met for a buffet lunch and then listened to a most enjoyable talk given by Professor J.R. Hodges, Chairman of the Avicultural Society Council, entitled 'Further Avicultural Reminiscences'. By popular request Professor Hodges continued the theme which he had talked about some years ago at a meeting in London, telling anecdotes and showing slides of interesting people and birds that he has encountered. Judging by the enthusiastic reception, it seems likely that Professor Hodges will be asked to describe 'Even further reminiscences' before long.

The Council meeting, which should have been held before this lunch was cancelled.

The next gathering this year will be the President's Garden Party on Sunday, 4th June. Members are reminded that the demand for tickets for this occasion always exceeds the number available so they should apply as soon as they receive the notice. We regret that we must say one guest only per member.

Hon. Secretary and Treasurer

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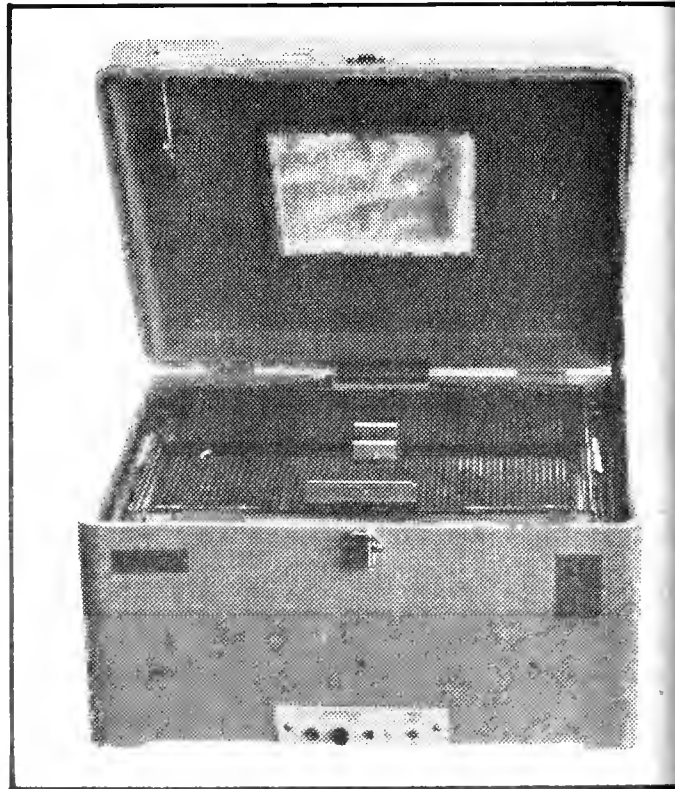
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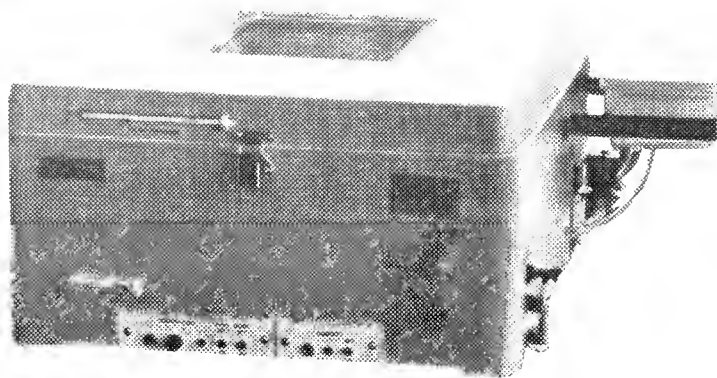
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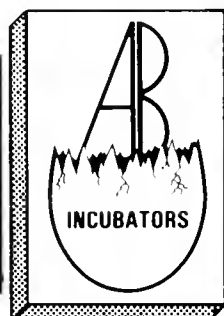


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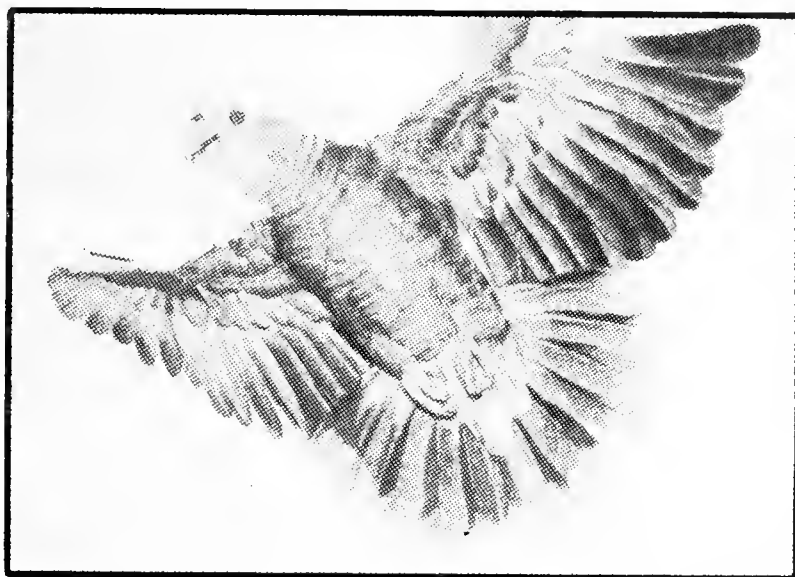


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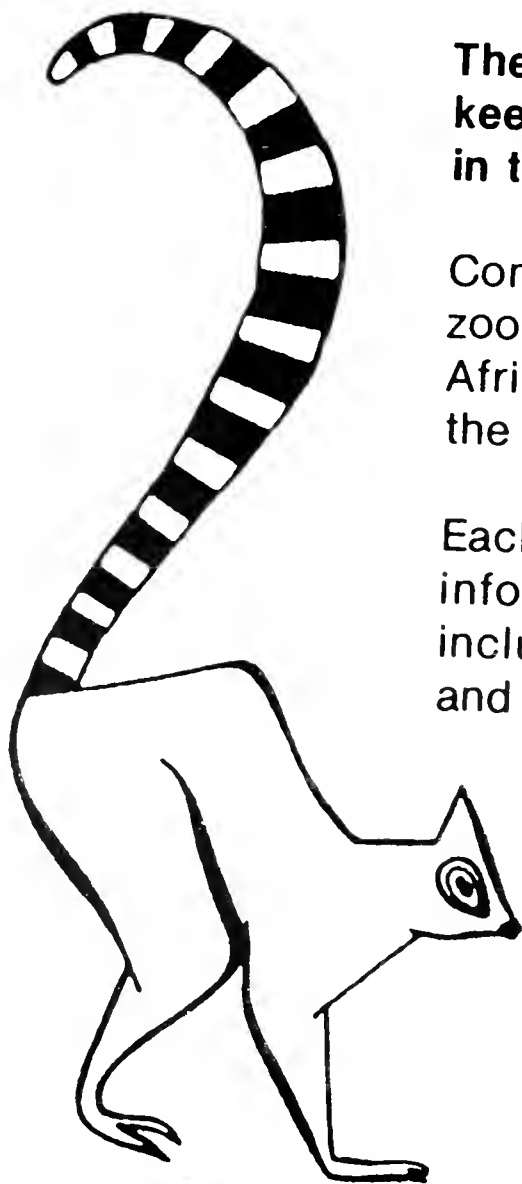
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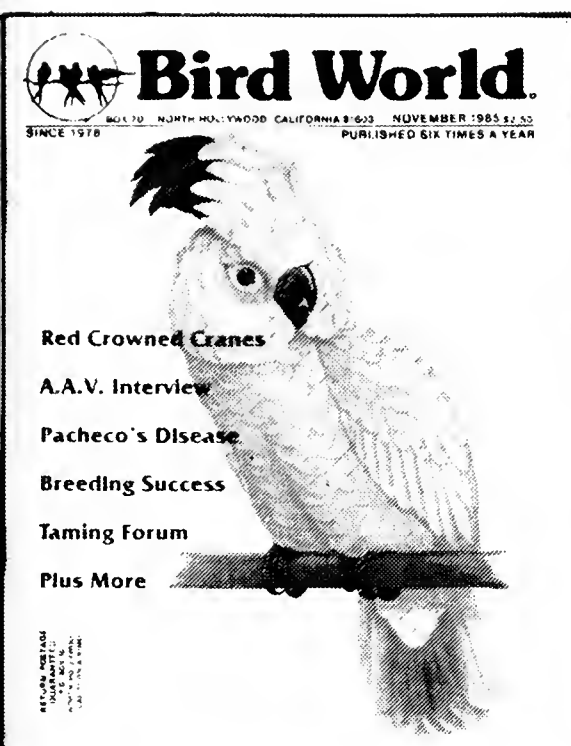
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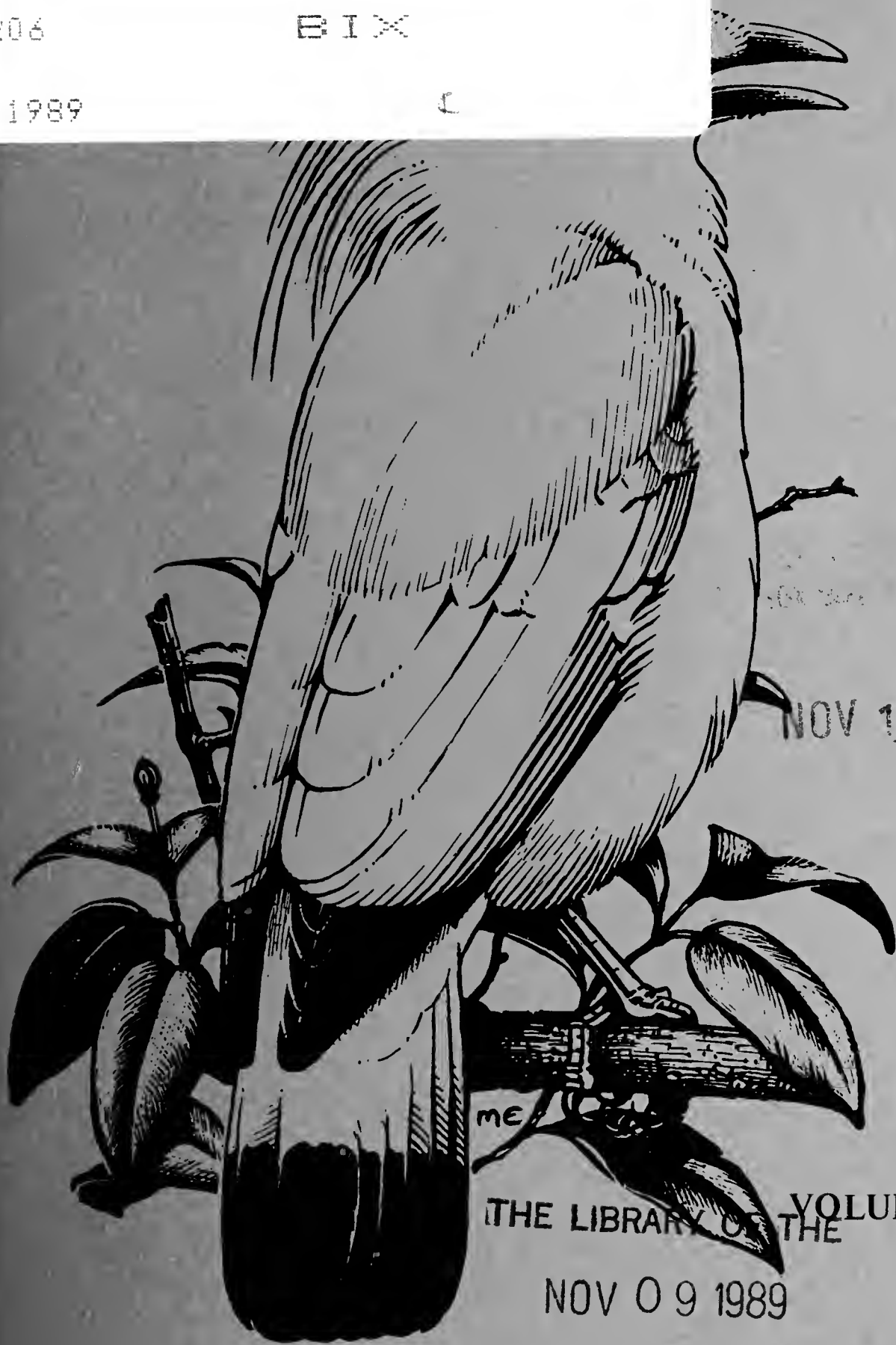
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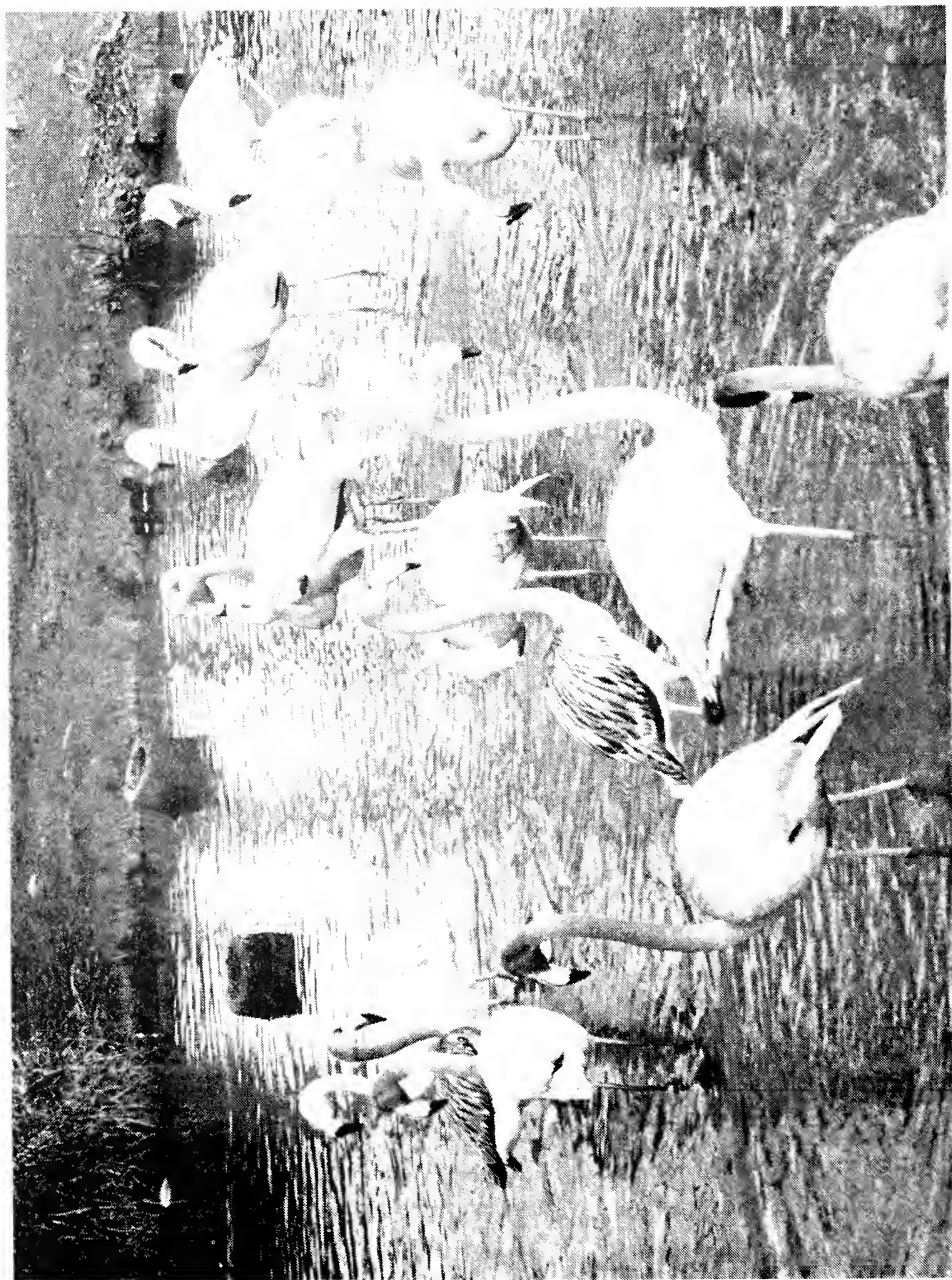
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ADDRESS OF EDITOR

Mary Harvey, Honorary Editor, The Avicultural Magazine, Warren Hill, Hulford's Lane, Hartley Wintney, Hampshire RG27 8AG, England.

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Mixed flock of Caribbean and Chilean Flamingos at Chester Zoo

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1989

BREEDING AND MANAGEMENT OF FLAMINGOS AT CHESTER ZOO

By ROGER WILKINSON
(Curator of Birds)

The history of flamingos at Chester Zoo is best documented from 1st January 1962, from which date we have stock books detailing the birds within the collection. Other records indicate that Caribbean Flamingos *Phoenicopterus ruber ruber* were received at Chester in 1958, and Greater Flamingos *Phoenicopterus ruber roseus* imported from John Seago in Kenya in September 1957.

Flamingos, then, have been held at Chester Zoo for at least 30 years. The numbers and species of flamingos kept at Chester are listed in Table 1. Between 1971 and 1979, Chester held all six species of flamingo, with Lesser *Phoeniconaias minor*, Andean *Phoenicoparrus andinus* and James' Flamingo *Phoenicoparrus jamesi* in very small numbers. The single Lesser and Andean Flamingos and the two James' Flamingos were sent to join the flocks at Slimbridge in 1979, Chester receiving four Caribbean Flamingos in exchange. Subsequently, in 1981, the remaining three Greater Flamingos were exchanged for two Caribbeans. This left Chester with a mixed flock of 19 Chilean *Phoenicopterus chilensis* and nine Caribbean Flamingos.

Clearly at this stage, with Caribbeans (rather than Chileans) received in exchange for the species leaving the collection, the path was set for building up flocks of both the Caribbean and Chilean Flamingos. Thus, when a flock of Caribbean Flamingos became available in 1984, we decided to purchase them. More recent acquisitions of Caribbeans from Whipsnade have come to us on deposit, and Chileans from Harewood Bird Gardens by way of exchange.

Enclosures

Guidelines for keeping flamingos in captivity are given in Kear (1974)

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and Duplaix-Hall and Kear (1975).

The previous Curator of Birds, Peter Stevens, initiated a series of changes, which resulted in our present enclosure. A larger water area was created, which is shallow at the edges and sufficiently deep in the centre to allow the birds to mate whilst in the deeper water. The shallower areas at the edges were where we hoped nest-building would occur. Recent modifications to this area have included sinking lengths of wood across one of the bays to form a barrage, then filling this area with extra mud, and placing artificial concrete nest-mounds in this area.

Two types of artificial nest mounds are provided. These were made by using a bucket as a mould for one and a shallower wider bowl for the other. These concrete mounds are positioned in the nesting area with the wider inverted bowl-type mounds in the shallower water near the edge of the lagoon and the inverted bucket-type mounds in slightly deeper water away from the water's edge.

Management and Feeding

The flamingos are held throughout the year in the same enclosure (some collections move their birds to separate winter quarters), but are locked into their heated shelter at night during the winter months. Protection from foxes is provided by the electrical outer fence, which is activated at night during the summer months.

The flamingos are fed on a commercially produced, pelleted diet, which contains 18% protein, but the birds also obtain some natural food from the water area of the enclosure. In spring and early summer this diet is replaced with a 'breeding diet', in which the protein level is raised to 35%, to mimic changes presumed to occur in the wild, with an algal bloom during the breeding season. The flamingos are less keen on this stronger mix, and it has to be phased in gradually. Both the standard and breeding diets contain canthaxanthin, a substance necessary to produce the bright orange-pink colour which signals breeding condition in flamingos.

Flock composition and behaviour

The Chester Zoo flock consists of both Chilean and Caribbean Flamingos. At the beginning of the breeding season in April 1987 the flock comprised ten male, eight female and six unsexed Caribbeans (the latter were young birds received in 1986 from Whipsnade Zoo) and eight male, fourteen female and one unsexed Chilean Flamingos. Sex was determined for different birds by laparoscopy or size differences between the sexes. Males tend to be larger than females of the same species but there is some overlap in ranges of measurements of the two sexes. All birds are individually identifiable by means of darvic leg rings engraved with two-figure or

number combinations. Observation of birds on the nest and those accompanying them was aided by the use of a telescope, without which the recording of individual birds' leg rings would have been impossible.

Outside the breeding season both species tend to gather in separate single-species flocks. Prior to 1987, nests had been built and copulation observed but no instances of pairing between the two species was noted.

Pair bonding

Table 2 lists the combinations of birds seen consistently together at nests in 1987. At the majority of nests pairs consisted of birds of the same species. However, nest 87/1 was occupied by a Chilean female and a Caribbean male and although that male was not seen to copulate with the female, the chick produced from this nest appears to be a hybrid. Another possible cross-pairing occurred at nest 87/5 where three birds were observed to share incubation duties. There a female Chilean shared incubation with a male Chilean and a male Caribbean but this egg failed to hatch. All other pairings were pure with three pairs and one trio of Chileans (the latter comprised one male and two females) and a total of six pairs of Caribbeans.

Long-standing pair bonds are suggested by the pairing combinations which were apparent in these breeding attempts at Chester. Both partners at nests 87/3 and 87/4 were received together from Birdland in 1969 and may have continued bonds established some 20 years ago. Similarly, at nests 87/4b, 8a and 9, the pairs were formed from birds all received in 1984 from Mole Hall where they had previously been held for some 18 years.

The newest pair formed was that of the Chilean male AR, hatched at Harewood Bird Gardens in 1984, and only received at Chester Zoo in April 1987 with the older female A1222 hatched at Whipsnade in 1980 and received at Chester in 1982. Studer-Thiersch (1975) noted that new pairs of flamingos at Basle Zoo would not breed until the following year. It is of interest to note that female A1222 laid in late July, less than three months after the arrival of her partner AR.

In 1988 additional data on breeding associations was obtained and this is listed in Table 3. Of the 12 combinations identified in 1987, 10 were continued into 1988 including the triadic relationship of the males Chilean AD and Caribbean FS with the female Chilean AN. Following the death of the male Chilean AD in June 1988 the Caribbean male FS re-nested with the Chilean female AN.

After successfully rearing a chick in 1987, it was surprising to find that the Caribbean female FN and male AT had separated and that AT paired with the female AF, leaving FN unpaired in 1988. This was the more sur-

prising in that there was a surplus of Caribbean males with which FN could have nested. The other change of mate involved the Chilean male AB and female 19, which separated in 1988. The male AB paired with the female BL (which was associating with the pair in 1988) and the female 19 formed an association with the Chilean female 01. In the latter case both females shared the incubation of two eggs, suggesting that each bird had laid in the shared nest. A second association of two females was that of the Chileans AJ and 21.

Other new associations in 1988 were the Caribbeans AJ and FU (which reared a chick), the Chileans 13 and 11, and the hybrid association of the Caribbean male FX and Chilean female 23.

Age of breeding birds

The Chilean females A1222 and 19 were seven years old on their first breeding attempts. Four other Chilean females AV, AL, AN and 26 were received as adults from Birdland in 1969, and BL was received earlier in 1966. These five birds were then at least 20 years old when they laid their first eggs at Chester. The Caribbean female FT which laid for the first time at Chester in 1987 and successfully reared her chick, was obtained as an adult from Chicago Zoo in April 1959. She was at least 29 years old on this her first breeding attempt at Chester Zoo.

Copulation

Copulations from July to September 1987 were, with the notable exception of one pair, infrequent. Mating behaviour was preceded by the pair separating from the rest of the flock and wading out into deep water with the male closely following the female. When receptive, the female stops and stands in deep water allowing the male to climb on her back and achieve mating.

In 1987 no copulations were seen that involved mixed matings of Caribbeans and Chileans although these were presumed to have occurred between the mixed pair at nest 87/1. One unidentified male Caribbean was seen to follow a female Chilean but copulation did not follow. However, in 1988 Chilean 26 was mated by Caribbean AX. Following the death of the Chilean male AD the Caribbean male FS was observed mating the Chilean female AN.

In 1987 the Caribbean male AI was particularly insistent on mating with his partner FP when she left the nest, and would follow her into the water to copulate. This left their nest unguarded. This behaviour continued until less than a week before their egg hatched and appeared non-adaptive in that the cost of egg-loss would appear to be great compared to that of possible cuckoldry at this late stage in the breeding cycle.

Copulation outside established pairs was attempted; for example, by the Chilean male AA which frequently followed, and on several occasions attempted to mate, the female A1222 in both 1987 and 1988. However, none of his witnessed attempts at promiscuous mating were successful.

Nesting

Nests were built from mud, on top of the artificial nest mounds provided and also on the bare ground near the edge of the lagoon or, in several instances, at some distance from the water. Where reeds and other vegetation were incorporated into the nest mound then this made the nest more substantial than those built with mud alone. All four wider bowl-type concrete nest mounds were used as a basis for the building of nests. None of the bucket-type mounds were used.

In previous years, nests had been built within the lagoon area created for nesting and provided with artificial concrete nest bases and also on one of the islands. Indeed, the island site had been specially favoured by the flamingos. In 1987, although some nest-building occurred on the island, all occupied nests were built in and around the lagoon area. As previously noted, some were built on to the concrete bases and others straight on to the bare earth or within a flattened nettle patch.

Nest 87/10, built by a pair of Caribbeans and from which a chick hatched but failed to survive, was built some distance from the other nests on bare ground close to the feeding area. Other nests were clumped close together. There was no evidence of Chileans and Caribbeans choosing separate areas for nesting; the two species behaved as a single colony. Occupation of nest sites was studied from the hatching of the first chick on 6th July 1987. Nest site 87/8, first used by a pair of Caribbeans and deserted after their egg was found broken, was then used for two nest attempts by the Chileans AB and 19. This suggests that this nest site was particularly attractive to the flamingos. If so, the series of egg losses at this nest may be explained by competition for this nesting area. The period of only three days between the loss of the second egg and laying of the third at this nest may suggest that two different females were involved. Chilean female BL was observed sitting on this nest the day before the appearance of the third egg and although she subsequently rarely incubated, this may have been because of the dominance of the female 19 in this trio.

In 1988 the earliest nests were built in the lagoon area favoured the previous year. One pair of Caribbeans nested away from the other birds and close to the feeding area. This nest, 88/8, was built at the same site as 87/10 by the same pair of Caribbean Flamingos, FP and AI, that used this site in 1987. Additionally, one pair of Caribbeans and one pair of Chileans built nests on the island.

Following the desertion of the lagoon nest sites and of nest 88/8 following a predator incident in June 1988, the island then became the focus of later nesting activities for all but one pair of flamingos. That pair, Caribbeans AJ and FU, occupied nest 88/8 deserted by FO and AI. Perhaps because of the nest's isolation, AJ and FU were rather inconsistent sitters leaving their egg unbrooded for lengthy periods. All the other flamingos nested together on the island with perhaps more clumping of Chilean nests than had been noticeable in 1987.

Incubation

Incubation was by both sexes and incubating birds remained on the nest for long periods. Changeovers were infrequent and the identity of incubating birds could only be established at changeover or when they stood up to inspect the egg below them. The best time to watch the birds was at feeding time when the general excitement of the flock would result in the incubating birds rising off the nest to get a better view of what was happening around them.

The numbers of times individual birds were identified incubating at different nests are recorded in Tables 2 and 3. Within different pairs (and trios) there was variation in the degree to which incubation duties were shared but on average, males appeared to take an equal role to females. In those pairs in which males were observed incubating more frequently than females, it was noticed that the males were most often seen incubating towards the end of the incubation period rather than during the first few weeks of incubation.

Hatching and care of young

The normal incubation period quoted for flamingoes is 27-31 days with hatching taking 24-36 hours (Studer-Thiersch, 1975). We were able to determine the incubation period at three nests in 1988. At one nest this was calculated to be between 27 and 29 days, at another a minimum of 32 days and at a third to be 37 days. In the latter case, the parents AJ and FU spent long periods off the nest, to the extent that our concern led us to remove the egg to an incubator, substituting an infertile egg in its place. This substitution was made 20 days after the egg was laid. Candling showed that the egg was developing normally although it had not reached the stage that would have been expected for three-quarters through incubation. The egg was left in the incubator for a further eight days then returned to the nest where it hatched nine days later. We assume that the parents' lengthy periods off the egg led to its cooling and slowed its development.

The chicks remained on the nest for the first few days being brooded



Wayne McLeod

First Caribbean Flamingo hatched at Chester Zoo, July 1987

by either parent and later positioning themselves in the space between the body and wing of the brooding adult. The first chick to hatch in 1987 left the nest at four days old and returned to be brooded on the nest the following day. It was then rarely seen near the nest but was brooded by its parents in other areas of the enclosure. The chick hatched on 27th July 1987, did not leave its nest until seven days old and returned to be brooded on the nest more frequently. It was last seen being brooded by its mother on the nest on 17th August when about three weeks old. The third surviving chick of 1987, hatched on 4th August, briefly left the nest on 10th August but continued to return to the nest site, last being seen to be fed on the nest by its father on 19th August.

Feeding by both parents of the rapidly growing chicks continued through the summer and autumn. The Caribbean chick hatched in early July 1987 was still being occasionally fed in November, and the chick hatched in August was seen being fed in February of the following year. Adults feeding young lost much of their pink coloration, the carotenoid pigments colour the crop-food secretion red and apparently robbing that to their growing feathers (Ogilvie and Ogilvie, 1986). This loss of colour occurred for all six successful parents and served to confirm that the Caribbean male FX was providing food to its presumed hybrid young.

Factors initiating breeding

Why did the flamingos breed at Chester in 1987 and not in earlier years? I believe a combination of factors was involved. The enclosure had been well designed and allowed the birds both deep water for mating and shallow areas for nesting: minor improvements here were unlikely to have had great effect on breeding potential. The birds were being fed an adequate diet, and the level of protein had been pumped up prior to breeding. Spring was particularly wet, and this may have provided the best conditions for stimulating breeding. The nesting area was left undisturbed and grass was not cut within the enclosure. All the above factors could have helped, but my personal opinion is that the balance was tipped in favour of breeding, with the acquisition of the flock of Caribbeans in 1984. These birds, which had previously nested and laid eggs (but not hatched young) at Mole Hall, initiated the breeding at Chester. The first two pairs to lay eggs in June 1987 comprised individuals from Mole Hall which had in all probability continued already established pair bonds. We suspect, but cannot be sure, that these were the individuals which had previously laid at Mole Hall. Anyway, the following events surprised us all, for another 10 pairs of flamingos followed their example and nested and laid eggs in 1987.

Management Problems

Our immediate problem is with avoiding any further hybridisation. Many hours have been spent watching the flock to obtain the information noted above. As long as we maintain Chilean and Caribbean Flamingos in the same exhibit, we must continue to monitor closely their family life. Where hybrid pairs occur, our policy must be, as it was in 1988, to interfere by removing those eggs and replacing them with wooden dummies in order to discourage these birds from re-laying. At present our flock structure is such that we have more male than female Caribbeans and vice versa with the Chileans. This situation has predisposed our group towards hybridisation. It is noteworthy that Caribbean males paired with Chilean females, and not vice versa, and that with the 1987 trios, the supernumary birds were a Caribbean male in one case and a Chilean female in the other. Also in 1988 both homosexual associations were between supernumary Chilean females.

Although we can hopefully correct our present sex imbalance (this is difficult in that Caribbean males appear to be easier to find than females) and guard against hybrid pair bonds, we will never be certain that out-of-pair mating does not occur. Accordingly our long-term policy must be to have only single-species flamingo exhibits and a new enclosure is planned for the Chilean flock.

TABLE 1: FLAMINGOS AT CHESTER ZOO
(as at 1st January of the year)

Year	Caribbean	Chilean	Greater	Lesser	Andean	James	Total
1962	6	-	7	2	-	-	15
1963	5	-	7	2	-	-	14
1964	4	-	7	2	-	-	13
1965	4	-	6	1	-	-	11
1966	4	-	6	1	-	-	11
1967	4	6	6	1	-	-	17
1968	4	6	6	1	-	-	17
1969	4	5	6	1	-	-	16
1970	7	17	5	1	-	-	30
1971	7	23	5	1	-	-	36
1972	6	23	5	1	3	5	43
1973	6	22	5	1	1	4	39
1974	6	21	5	1	1	4	38
1975	6	21	5	1	1	4	38
1976	6	21	5	1	1	4	38
1977	6	21	5	1	1	3	37
1978	6	21	5	1	1	2	36
1979	9	21	5	*	*	*	35
1980	7	19	5	-	-	-	31
1981	7	19	3	-	-	-	29
1982	9	19	+	-	-	-	28

TABLE 1 (Contd.)

Year	Caribbean	Chilean	Greater	Lesser	Andean	James	Total
1983	9	22	-	-	-	-	31
1984	8	20	-	-	-	-	28
1985	19	19	-	-	-	-	38
1986	19	20	-	-	-	-	39
1987	24	18	-	-	-	-	42
1988	25	23	-	-	-	-	48

*Sent to the Wildfowl Trust, Slimbridge, in exchange for Caribbean Flamingos

+Exchanged with private source for Caribbean Flamingos

TABLE 2: BREEDING PAIRS AND TRIOS OF FLAMINGOS, WITH
NUMBERS OF BOUTS ON WHICH EACH BIRD IDENTIFIED INCUBATING
(1987 DATA)

Nest No.	Female	Bouts Incubating	Male	Bouts Incubating
87/1	Chilean 26	12	Caribbean AX	2
2	Chilean A1222	8	Chilean AR	15
3	Chilean AV	21	Chilean AA	16
4a	Caribbean AH	-	Caribbean FK	-
4b	Caribbean FL	7	Caribbean FR	15
5	Chilean AN	9	(Chilean AD (Caribbean FS	16 8
6	Caribbean FT	12	Caribbean FV	4
7	Chilean AL	12	Chilean 16	18
8a	Caribbean AP	2	Caribbean FO	-
8b	Chilean 19	2	Chilean AB	2
8c	(Chilean 19	15	Chilean AB	5
	(Chilean BL	1		
9	Caribbean FN	-	Caribbean AT	-
10	Caribbean FP	4	Caribbean AI	3

TABLE 3: BREEDING PAIRS AND TRIOS OF FLAMINGOS, WITH NUMBERS
OF BOUTS ON WHICH EACH BIRD IDENTIFIED INCUBATING (1988 DATA)

Nest No.	Female	Bouts Incubating	Male	Bouts Incubating
88/ 1	Chilean BL	2	Chilean AB	2
1a	Caribbean AH	1	?	
3	Caribbean FT	2	Caribbean FV	1
4	(Chilean AN)	0	(Chilean AD (Caribbean FS	3 2
5	Caribbean AF	1	Caribbean AT	3
6	Caribbean FL	3	Caribbean FR	3
7	Chilean AR	1	?	
8	Caribbean FP	2	Caribbean AI	1

TABLE 3 (Contd.)

Nest No.	Female	Bouts Incubating	Male	Bouts Incubating
8a	Caribbean AJ	3	(Caribbean FU)	0
9	Caribbean AP	12	Caribbean FO	13
9a	Caribbean AP	1	?	
10	Chilean AL	12	Chilean 16	12
11a	Chilean BL	7	Chilean AB	10
11b	Chilean BL	4	Chilean AB	2
12	Chilean A1222	7	Chilean AR	8
13a	Chilean AV	3	Chilean AA	5
13b	Chilean AV	5	Chilean AA	1
14	Caribbean FP	3	Caribbean AI	8
15	Caribbean FT	3	Caribbean FV	3
15a	(Chilean AJ	6		
	(Chilean 21	2		
16	Caribbean AF	2		
17	Caribbean FL	6	Caribbean FT	8
17a	Chilean 26	8	Caribbean AX	5
18	Chilean 26	2	Caribbean AX	2
19	(Chilean 19	6		
	(Chilean 01	7		
20	Chilean 23	2	Caribbean FX	1
20a	Caribbean AH	4	Caribbean FK	7
20b	Caribbean FP	4	Caribbean AI	4
21	Chilean 13	4	Chilean 11	6
21a	Chilean A1222	2	Chilean AR	2
24	Chilean AN	8	Caribbean FS	7
25	Caribbean FP	4	Caribbean AI	4

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BREEDING AND BREEDING BEHAVIOUR OF DOUBLE-BANDED SANDGROUSE

Pterocles bicinctus

BY S.A. HINSLEY AND D.J. HOCKEY

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Introduction

The Sandgrouse form a distinct group of desert-dwelling birds, usually now classified as a separate order (Cramp and Simmonds, 1985). They are superficially pigeon-like with compact bodies, small heads and short legs. Flight is direct and powerful and flight calls, especially frequent on trips to and from water, are an excellent guide to identification. Their distribution is largely Afro-Asian with only two species occurring in southern Europe. They are chiefly granivorous but a variety of green plant material is also taken by some species.

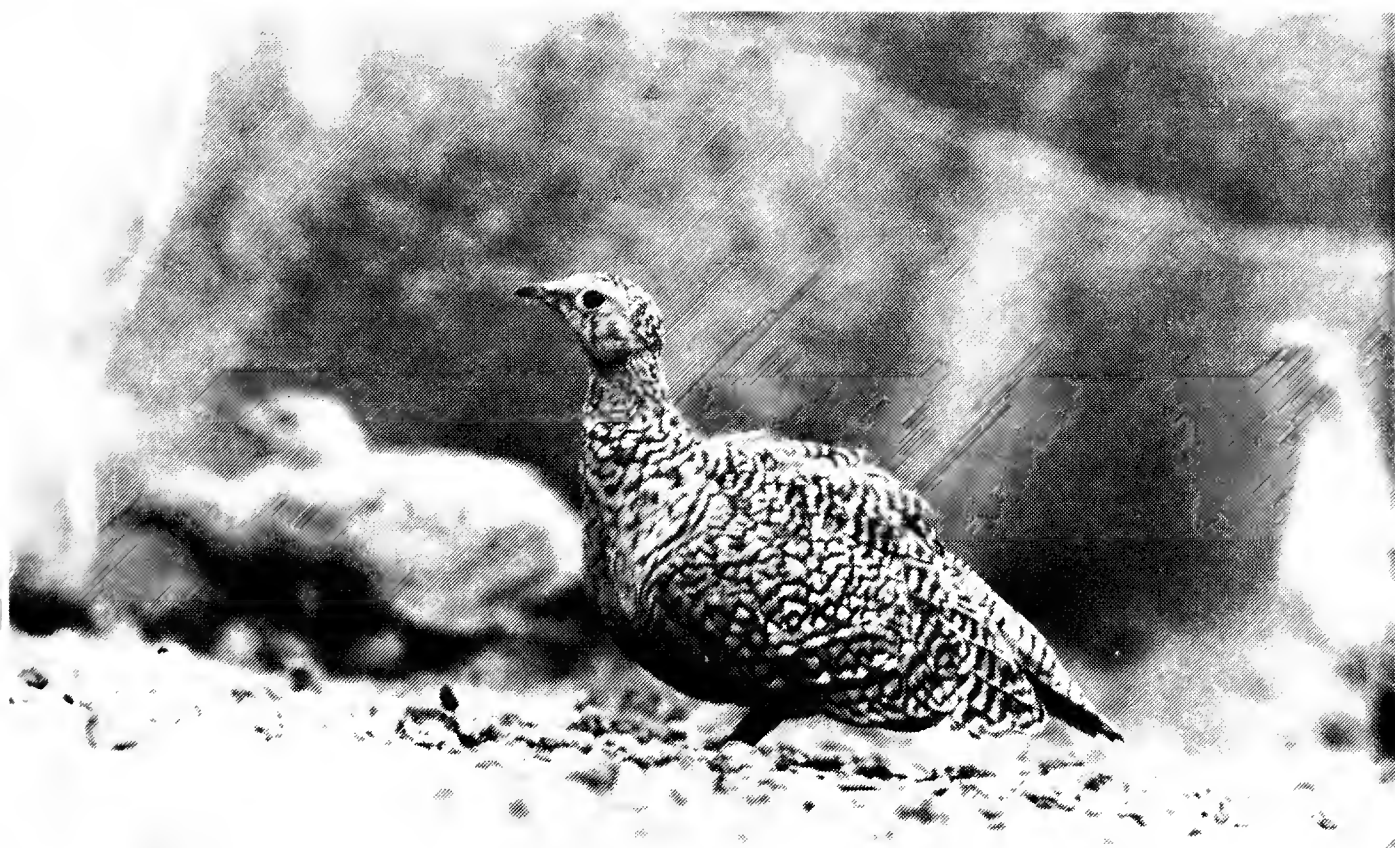
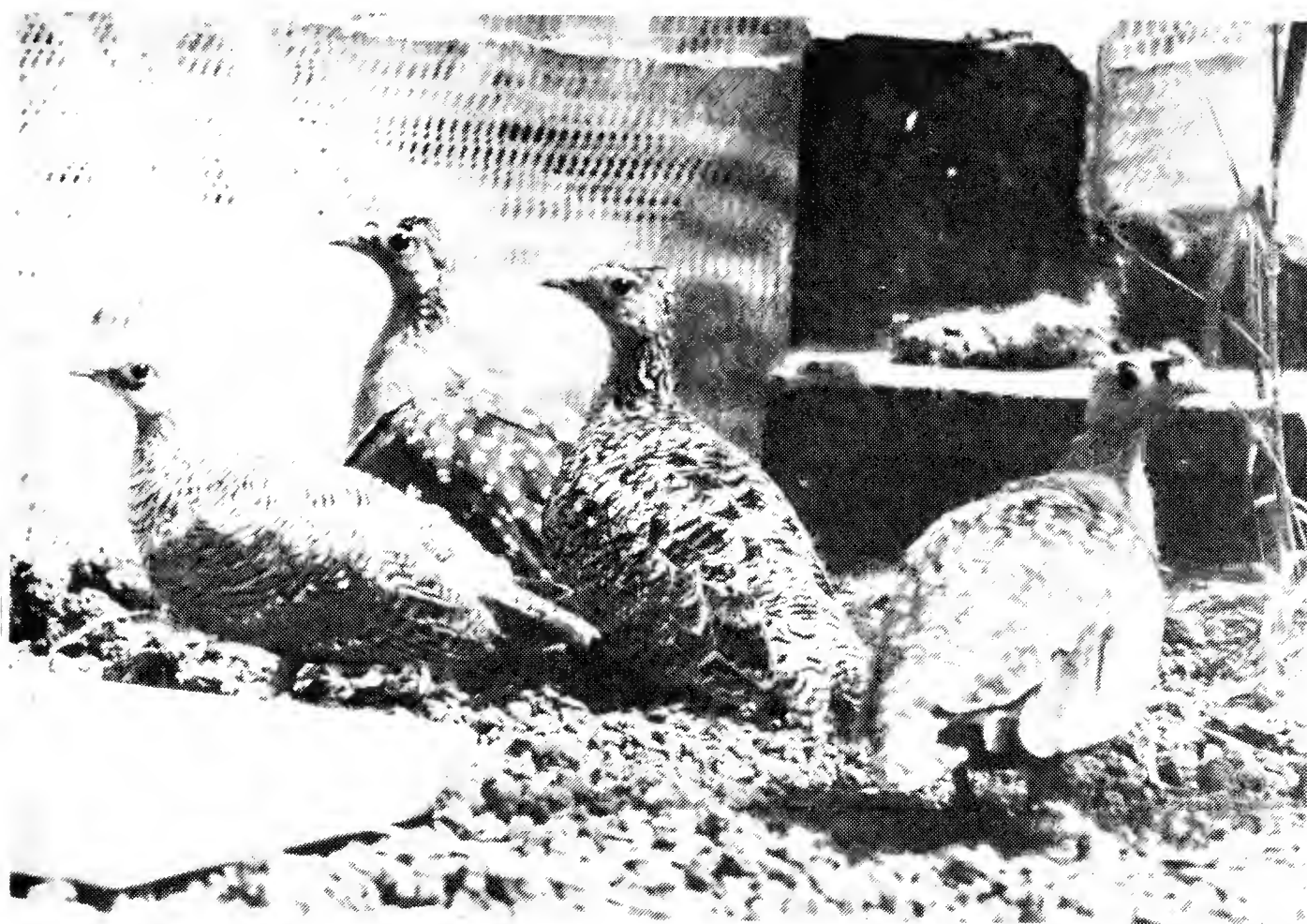
Habitat

The species discussed in this article is the Double-banded Sandgrouse *Pterocles bicinctus* from southern Africa. Its range extends from Namibia and Angola in the west to Zambia, Zimbabwe and Mozambique in the east. Their habitat is varied, ranging from wooded savanna and dry grassland through to very arid rocky and gravelly areas with tussock grass and scrub.

Description

The Double-banded is one of the smaller species of sandgrouse, weighing around 200 grams. The male has a grey/buff face, neck and chest with a black and white chestband. The forehead has transverse black and white stripes and the crown is streaked brown. The belly, back, rump, tail coverts and short tail are closely barred with dark brownish grey and brown with many feathers tipped white. The mantle, scapulars and wing coverts are largely grey washed with buff and pale olive, with soft brown bars and conspicuous white spots. The primaries and secondaries are dark brown to black and the wing linings dark grey. The tips of the wings are usually carried tucked beneath the sides of the tail. The legs, of which the tarsi are feathered in grey on the front, feet and bare skin around the eyes are yellow and the bill orange. The eye is large (in the wild, Double-banded Sandgrouse are chiefly crepuscular and drink after dark) and dark brown.

The female is mottled brown with barring and spotting in grey and white. The white spots are particularly concentrated on the tips of the



S.A. Hinsley

(Above) Three-month old Double-banded Sandgrouse chick (left) with parents (male right, female centre) and associated non-breeder, male M (rear).

(Below) Six-month old Double-banded Sandgrouse chick after moulting into first adult-type plumage.

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mantle feathers, scapulars and coverts. The belly, tail, tail coverts and back are similar to the male but more rufous and the wing linings are again grey. The bare parts are also similar to the male but less bright and with the bill dark tipped. A full description is given in Urban, Fry and Keith (1986).

Origin of birds

In 1984, a group of Double-banded Sandgrouse were imported under licence from Namibia as wild-caught adults. We first became involved with them in August 1985.

Housing

The birds, seven males, two females and one juvenile female, are housed in an aviary inside a greenhouse. The aviary is shared with five pairs of Pin-tailed Sandgrouse *P. alchata*. Originally, the two species were kept separately but since August 1988 they have lived as one flock with no difficulties. The aviary, measuring 12 x 6 x 2m, is constructed of a soft nylon mesh held under tension by a string framework with the bottoms of the walls buried in the ground. The birds are thus free to fly without suffering any damage. The floor is of earth, varying from hard-packed to soft and is renewed yearly. Some vegetation is encouraged to provide shade and hiding places. The greenhouse successfully produces high, desert-like temperatures on any sunny day but we were initially concerned about the high humidity. However, to date this has had no apparent ill effects. Heat lamps (a mixture of 150w spot lamps and 250w infra-red lamps) are provided in the winter from approximately October to April depending on the weather conditions. Although the birds appear to 'enjoy' the lamps, frequently preening and dusting beneath them, they do not seem to be strictly necessary since some birds will commonly roost well away from them even with night temperatures as low as 0-5°C. The lamps also rapidly detect any individuals who are 'off-colour', these birds spending much more time than usual underneath one. To date, all such birds have returned to normal after a few days of this self-administered heat treatment.

Diet

The birds are fed a mixture consisting of three parts mixed millets, two parts chick crumbs, two parts red milo, two parts groats, two parts whole hemp and one part linseed. Approximately twice a week they are also given Haith's 'Quail Mix' and cut maize and, less frequently, lentils. In the breeding season, Haith's 'Rearing and Condition Food' is provided (fed dry). The birds do not appear to eat any green or insect food; mealworms

offered to laying females were ignored. They are fed every other day, most of the seed being placed on trays at six sites around the aviary and with the remainder just scattered on the ground. A soluble vitamin supplement, Antec 'Multi-vitamin Extra', is added to their water for three days every two weeks. Grit, crushed oystershell, cuttlefish and salt/mineral blocks are freely available at all times.

Before October 1987, the birds were given a powdered vitamin supplement (dusted on to their seed) and the diet did not include chick crumbs. Up to this date, all embryos died during the last third of incubation, some apparently ready to hatch. We suspected that an undetected vitamin deficiency in the adults was proving lethal to the embryos and hence changed the diet to that described above. Since this change, four out of five fertile eggs incubated by the birds have hatched successfully. The failure of the eggs incubated artificially was thought to be due to poor incubation technique compounded by problems of having eggs of different ages in the same incubator.

Breeding season

A summary of their breeding attempts is given in Table 1. The onset of laying has occurred earlier each year so far, the earliest egg to date being laid on 1st January 1988. The comparatively late start in 1986 could have been influenced by the birds' need to settle in to the aviary. Mid-winter seems an odd time to begin breeding and does not tally with the breeding season for their natural habitat either, this being April to October, particularly May to July, and some also in November and December (Urban, Fry and Keith, 1986).

Sexual behaviour

The birds become noticeably sexually active from about November onwards. Monogamy is the rule and males will defend their females aggressively. However, both sexes will sometimes indulge in extra-pair activity and one of our established pairs has formed a trio with a non-breeding male. This bird, male M, joined them in rearing a fostered brood of Pin-tailed Sandgrouse chicks and is currently helping with the incubation of their fourth 1988 clutch.

At least seven complete copulations have been observed and in all cases involved an interesting post-copulatory display. Proceedings begin with the male displaying to the female. The wings are held away from the body but still closed, the tail is held down almost vertically, touching the ground, and the head is retracted and also held down with the bill pointing at the ground. The bird moves with a stiff, slow gait and exaggerated stepping, usually within 1-3m of the female, and whilst walking, often

in a small circle or on the spot, pecks at the ground. This pecking is the same action as performed by an adult 'feeding' a chick (see later), i.e. items are repeatedly picked up and dropped. An interested female will approach the male, sometimes very rapidly or even with a short, flapping flight, and join him in pecking at the same spot. She may then crouch down at that spot or walk away a few steps and crouch. The pecking together can be omitted with the female simply running or flying close to the male and crouching. The male walks around behind her, with a more normal but tense body posture and a very deliberate, slow gait and mounts. Copulation lasts about 15-20 seconds. As it proceeds, the male slowly opens his wings until, at the time he dismounts over the female's head, they are fully spread laterally. After dismounting, he runs a short distance and then stands very erect, with legs stretched and chest out and his wings held out sideways, fully open, displaying the dark grey wing linings. We have called this posture the 'heraldic display'. It can be held for 10-30 seconds before he slowly relaxes, closes his wings and resumes a normal standing posture. The female appears to pay no attention after the male dismounts, usually being occupied in preening or having wandered off to feed.

One of us (S.A.H.) has seen copulations in three species of sandgrouse (Black-bellied *P. orientalis*, Pin-tailed and Spotted *P. senegallus*) in the wild and in none of them was there any kind of post-copulatory display. It is possible that it is an artefact of captivity but in one reverse copulation, it was performed by the female. The bird concerned, female Y, started to lay again when her surviving chick was nearly four weeks old (see Table 1). In an effort to get these eggs fertilised, she was given access to male S/Y with whom she had previously paired but who had lost her in a fight to male Y. The female was very keen to copulate and solicited the male repeatedly, running and flying up to him and crouching. He did not respond beyond a rather half-hearted initial displaying and eventually she mounted him. On two of these occasions, the male seemed terrified and did not co-operate but the third time, it appeared to be a normal copulation except with the positions reversed and the dismounting female performing the heraldic display. About 20 minutes after this, the male attempted copulation but fell off sideways. A repeated attempt a little later looked normal and successful and ended with the male giving the display. However, despite further matings on other days, the subsequent eggs were addled.

Nest and eggs

The nest consists of a shallow scrape about 120mm across. It is excavated by the bird resting on its breast and kicking soil out behind whilst

rotating in a circle. Both sexes do this but it is usually started by the male who may then be joined by the female. The nest is unlined in the conventional sense but it may contain, and have scattered around it, feathers, bits of dry vegetation, small stones and shells. Several scrapes may be initiated by the male, one of which the female then selects for laying. In 1986 and 1987, eggs were laid at 24 and 48 hour intervals but in the last season both females have settled to a 48 hour interval. Clutch size can be two or three eggs, the earlier ones usually being three. The eggs measure 34.0 x 25.4mm range 30.0-36.8 x 24.0-28.0mm (n = 18). They are more or less elliptical. Ground colour varies from white through very pale buff and orange to pink. This is marked with brown and grey spots and streaks, often more concentrated at one end than the other. A few eggs have extensive scribble marks giving a marbled appearance.

Nest defence

The nest site is defended against approaching 'strange' birds from a distance of approximately 2m. Females are more aggressive in this behaviour than males, first issuing a warning *chucking* noise which increases to a guttural *churr*, followed by a chase and attempts to peck the intruder if the warning is unheeded. The nest defence behaviour becomes more intense as incubation proceeds. Both sexes perform an aggressive display to human approach when still on the nest, of fluffing up the plumage, raising a wing and making short, rapid turning movements, whilst *chucking* and *churring* continuously. As with a trespassing bird, persistent intrusion can elicit pecking, with the bird even running or flying at the offending hand. If they leave the nest, they may perform a distraction display, crouching low, dragging a wing and/or tail and perhaps flapping the wings as if unable to fly whilst running an erratic course and *churring*.

Incubation

Incubation begins with the laying of the last egg. The pair are attentive to the nest during laying and sometimes one or the other will sit on the eggs for a few minutes at a time. Much time is also spent sitting beside the eggs. In hot weather, they tend to sit on the eggs for much longer periods but are not thought to be incubating. It is possible that this prevents the eggs being over-heated or at least being warmed sufficiently to begin development before the clutch is complete. On one occasion, although protected from the weather by the greenhouse, female 0 was seen to walk to her nest and stand over the eggs during a brief but very heavy shower of rain.

For both female 0's 1988 clutches, incubation changeovers have been seen at about 08.30 and 16.00h, with the male sitting during the day. This is the reverse of observations of other sandgrouse species in the wild

(Cramp and Simmonds, 1985, pers. obs.). For previous clutches, she has been observed sitting during the day and at night. It seems likely that this behaviour is highly atypical and produced by the environment of the aviary. Similarly strange, female Y appeared to do the majority of the incubation of her second 1988 clutch. The male spent most of his time sitting beside her, side-stepping on to the eggs when she moved off to feed and sidling off again when she returned. Her second mate of 1988, male S/Y, was never seen to incubate his first clutch but spent a week sitting on a piece of cuttlefish apparently mistaking it for an egg. For his second clutch, he incubated with such enthusiasm that the female had difficulty in getting him to leave the eggs when she wished to take over. In previous years, female Y consorted with several males, chiefly male Y and male S/Y, and laid eggs fairly haphazardly around the aviary. Those eggs placed in a reasonable scrape but which she attended only sporadically, were deliberately holed by pecking by female O whose nest was about 1.5m away.

Incubation under the birds lasted 23 and 24 days, counting day 1 as the day after the laying of the last egg, and hatching is synchronous.

Chick rearing

The young are precocial, becoming mobile as soon as they are dry and are well described in Urban, Fry and Keith (1986). Briefly, they are patterned above with brown patches outlined and marked with black, separated by white lines, and white beneath. The overall effect provides superb camouflage. When small, the chicks sit down and 'freeze' in response to the adults' alarm calls (*chucking* and *churring*) and can give an observer the impression that they have suddenly disappeared.

They are fed a mixture consisting of three parts chick crumbs, two parts red lentils, two parts green lentils, two parts Haith's 'Rearing and Condition Food', one part hemp seed and one part linseed. All these, except the rearing food, are finely ground in a blender before mixing them together. As they grow, the food is less finely ground and whole seed is gradually introduced, starting with millet. At about two months old, the chicks are eating the adult diet but supplemented with lentils and rearing food. They are given soluble vitamins in their water every other day for the first two weeks after which the frequency is gradually reduced to reach the adult rate at about two months old..

Sandgrouse are probably most well known for the way in which the male carries water to the young in specially modified belly feathers (Cade and Maclean, 1967). For the first pair to hatch chicks, we provided water in a metal tray with sides 4.5cm high, in addition to a shallow bowl for drinking. The intention was for the male to be able to step into the tray



S.A. Hinsley

Male S/Y, better known as 'Stripe' incubating. Note the large eye.

for belly soaking whilst preventing the chicks from getting in. This failed miserably on both counts; the male was put off and one of the chicks drowned. The other pair were given a gravel-filled tray with a sloping access point making it easy for adults and chicks to get in and out. This worked well and the male concerned, male P, belly-soaked until the chick was five weeks old. Unfortunately, we were unable to watch the watering behaviour as it occurred after dark. Whether or not the chick obtained its water from the male for the whole of the five weeks is also unknown but it seems unlikely that it had not learned to drink for itself prior to this. Female Y responded to her chick pushing against her flanks (for reasons not related to drinking) by belly-soaking weeks after it had learned to drink and indeed, it was never seen to take water from her.

When necessary, we give young chicks water in soaked cotton wool, into which they push their beaks enthusiastically. After a few days, they can be persuaded to take water from wet cotton wool in a dish by gently

pushing their heads down into it. Their natural tendency is to reach up since a male's wet belly would be above them. Just-dried chicks respond to a touch or nearby movement by stretching up and making searching movements with the head and bill whilst calling continuously. The cotton wool in a dish can be dispensed with once the chicks are drinking regularly for themselves. Chicks being watered by hand, but otherwise reared by their parents, will run calling to a human offering wet cotton wool. Having learned to drink for themselves, they run and hide from a human approach.

A major difficulty in maintaining the young chicks lay in keeping them warm enough in an unheated greenhouse in February. This was exacerbated by the behaviour of the adults who, although attentive parents, were content to brood one or two chicks whilst the remainder were getting cold a few feet away. With the clutch hatched by female Y, we confined them to a small section of the aviary, approximately 2 x 3m and provided two lamps, one infra-red and one spot lamp. This appeared to be working until one chick, at nine days old, was found dead, apparently chilled, in a sleeping posture about 0.5m from one of the lamps. After this, the whole small section was enclosed in polythene, with a vent in the roof to prevent overheating, and provided with a fan heater with the thermostat set at 25°C. This worked well and the same method was applied to the pair who subsequently reared their single chick to independence. This pair was enclosed in a polythene 'tent', 2 x 2 x 1m, with one infra-red lamp and a fan heater, the day after the chick hatched. We were concerned that such major interference might cause the adults to desert the chick, but, although they were highly nervous for several days and sometimes had to be returned to the tent after flying out through the vent, they reared the chick with no further interference from us. At four weeks old the chick flew out through the vent and circled the aviary, flying strongly. It is highly likely that chicks can fly short distances at three weeks and probably have some flight before this. After one month, the family group were given access to a small section of the aviary in addition to the tent and returned to the main section with the non-breeders ten days later.

At three months old, the chick had a pale, dusty-looking version of female plumage but with fewer white spots on the back and more barring. Between three and six months old, it moulted completely into an adult-type female plumage but still with less spotting. We were delighted that 'it' turned out to be female and feel sure that our unpaired males, one of whom is already showing an interest, would agree.

It is not possible to define a clear-cut age of independence. Young sandgrouse remain associated with one or both parents for several months

and quite possibly until the next breeding season. The chick remained with the adults whilst they tended their third clutch, often sitting beside the incubating parent, and joined them in 'feeding' (see later) a fostered brood of Pin-tailed Sandgrouse. She has shown no interest in their fourth clutch but still associates with the 'off-duty' parent, especially the female.

The chick which died at two months appeared to have some kind of developmental problem. At death, it looked like an oversized two-week old with a sparse covering of body feathers and stunted wing and tail feathers. Ten days previously it had been prescribed antibiotic for infection of some of the primary follicles and vitamin B12 to promote feather growth. Both treatments had worked well and the chick had begun a rapid growth of feathers when it died. The problem may have arisen from some kind of nutritional deficiency although its diet was the same as for the successful chick. It is also possible that the cold conditions prior to the introduction of the tent and fan heater had somehow disrupted normal development.

As is usual with precocial young, the chicks are self-feeding, but also receive encouragement to feed, and some actual food items from the parents. In the latter process, the adult picks up, for example, a seed and drops it in front of the chick who will, in turn, try to pick it up and swallow it. If the chick drops it, the adult may repeat the process with the same seed several times until it is finally eaten or eventually abandon it and try something else. When two or three chicks are feeding with one adult, they all peck in the area around the adult's bill, so provided that there are several seeds in one spot, they should all get something to eat. The adults do not necessarily select items that are small enough for chicks to handle or that are even edible. Also, chicks often feed in the parents' vicinity but ignore the items dropped by them, so we suspect that the main purpose is to encourage the young to peck rather than to feed them specific items. However, an element of learning what and what not to eat could well be involved. The chick hatched in the incubator that died at six days old was never very strong but the lack of stimulation to feed was probably a major contributor to its early death.

One aspect of the chicks' behaviour which seems strange in comparison to another species of which we have experience, the Pin-tailed Sandgrouse, is their quietness. Even when distressed, a chick can only be heard from a few yards away and when hatching, they can be heard scraping at the egg shell but not calling. In contrast, Pin-tailed Sandgrouse chicks can be heard in the egg inside the incubator from the far side of the room, and when hatched, from down a corridor through a closed door. In general, the Pin-tailed chicks are much more vigorous and robust than the fragile and delicate-seeming Double-banded chicks so perhaps we still have some way

TABLE I: SUMMARY OF DOUBLE-BANDED SANDGROUSE BREEDING ATTEMPTS

Year	Clutch	No. of Eggs	Dates of Laying	Type of Incubation	Outcome
PAIR: FEMALE O AND MALE P					
1986	1st	2	11.4, 13.4	Birds	2 advanced embryos D.I.S.†
	2nd	2	29.5, 30.5	Birds	As above
1987	1st	2	10.2, 11.2	Incubator	2*
	2nd	3	25.2, 27.2, 1.3	Birds	2 D.I.S. 1 addled
1988	1st	3	21.1, 23.1, 21.1	Incubator	2 advanced embryos, D.I.S., 1 addled
	2nd	3	24.2, 26.2, 28.2	Birds	1 hatched and reared, 1 D.I.S., 1 addled
	(a) 3rd	2	27.5, 29.5	Birds	2 addled
	4th	2	10.10, 12.10	Birds	Still incubating
PAIR: FEMALE Y AND MALE Y					
1986	No attempt to breed				
1987	1st	3	22.1, 23.1, 25.1	Incubator	1 pecked, 2*
	2nd	3	10.2, 11.2, 12.2	Incubator	2 pecked, 1*
	3rd	2	25.2, 27.2	—————	2 pecked
1988	1st	3	1.1, 3.1, 5.1	Incubator	1 hatched, died at 6 days, 1 died at hatching, 1 D.I.S.
	2nd	3	16.1, 18.1, 20.1	Bird	3 hatched, 1 drowned at 6 days, 1 died at 9 days, 1 died at 2 months
Male Y died 16.2 (kidney tumour), female reared chicks alone					
1988	3rd	2	11.3, 13.3	—————	Infertile
	4th	2	29.3, 31.3	—————	Infertile
PAIR: FEMALE Y AND MALE S/Y					
	(b) 5th	2	20.4, 22.4	Bird	Addled
	(c) 6th	2	20.7, 22.7	Bird	Addled
	7th	2	4.10, 6.10	Bird	Still incubating

†Dead in shell.

*Of these eggs, some were addled and some D.I.S.

(a) Three chipping Pin-tailed Sandgrouse eggs substituted for the birds' own addled eggs; three chicks hatched and reared.

(b) Two eggs substituted as above; two chicks hatched and reared.

(c) Two eggs substituted as above; two chicks hatched, one reared, one died.

to go in finding the right diet and conditions for these very beautiful birds; any suggestions welcomed. As far as we are aware, this is the first breeding of this species in Britain.

As subjects for aviculture, sandgrouse are to be highly recommended. As seed eaters, they are relatively easy to feed, they cheerfully tolerate temperatures from 0°C to 45°C, they appear to be robust and resistant to disease and parasites, they are long lived, will breed in captivity, have few if any excessively bad habits, become tame and friendly if treated kindly and all have their own, highly individual personalities.

ACKNOWLEDGEMENTS

We would like to thank Dr. D.H. Thomas, Dr. P.N. Ferns, Mr. P. Humphries and Mr. T. Rogers.

COMMERCIAL PRODUCTS CITED

ANTEC MULTI-VITAMIN EXTRA. Antec International Ltd. Windham Road, Chilton Industrial Estate, Sudbury, Suffolk. C010 6XD.

QUAIL MIX, REARING AND CONDITION FOOD and all other feedstuffs mentioned. John E. Haith, Park Street, Cleethorpes, South Humberside DM35 7NF.

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As described above, the Double-banded Sandgrouse *Pterocles bicinctus* has been bred by S.A. Hinsley and D.J. Hockey in 1988, and this is believed to be the first success in this country. Anyone knowing of a previous breeding in Great Britain or Northern Ireland, or of any other reason that would disqualify this claim, is asked to contact the Hon. Secretary.

NOTE: Since the time of writing, the chick described in this article has reared her own first chick and is currently incubating a second clutch of three eggs. Her parents have reared two more chicks and are incubating three eggs and female Y and male S/Y are also incubating three eggs.

S.A.H. and D.J.H.

THE HAND-REARING OF A VOSMAER'S ECLECTUS PARROT *Eclectus roratus vosmaeri*

By DULCIE COOKE
(Epsom, Surrey)

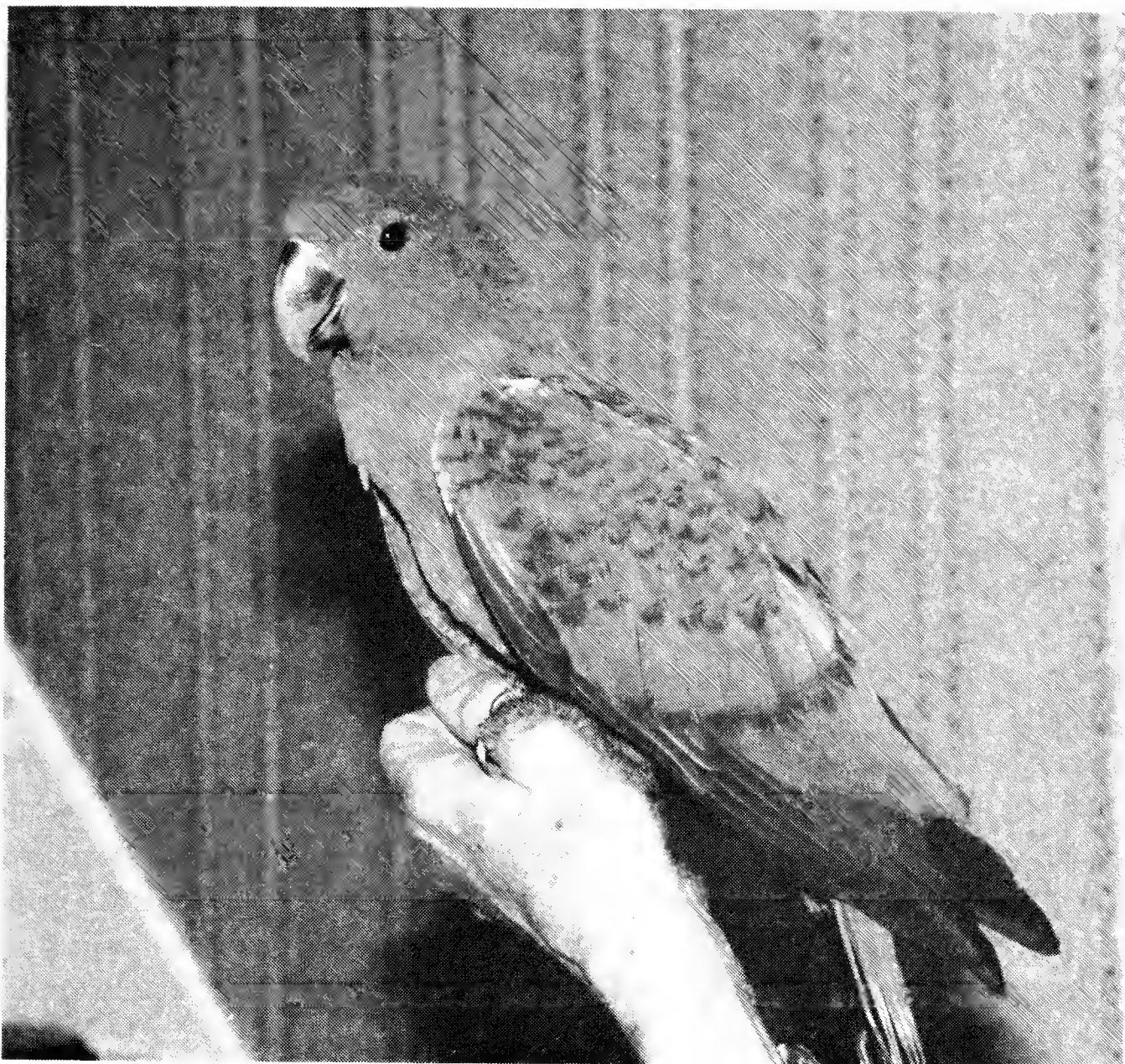
There is something particularly romantic about Eclectus Parrots; perhaps it is their name, so near to eclectic, meaning to choose the best of various subjects. To their owners, Eclectus simply *are* the best! The intensity of their colours, their dignified manners and great intelligence, plus in many cases their outstanding ability to talk, endear them to all who know and understand them. Some of them are exceptionally clever at making very sound common sense and comment on the situation of the moment; once they have acquired a reasonable vocabulary. Their own 'language' is exceptionally extensive and expressive.

Their dignified stoicism in face of adversity is a trait in their personality which those who know and love them have to admire. I well remember seeing a pair of these magnificent birds housed in a very large aviary-cage in light, airy and immaculately clean conditions in a large and well run commercial establishment selling birds. The hen was considerably plucked, where she had obviously taken her own feathers to line her nest; the cock had the slightly 'worn' look of a father of many young. They were otherwise in perfect condition. My husband Freddie and I wished we could have given the aviary space for another pair. These birds knew by instinct that we understood them; they had known happier times, and I shall never forget the silent pleading in their eyes. They wanted to be treated as individuals, to be given names and to have *their* home.

Joseph Forshaw, in his *Parrots of the World*, gives details of *Eclectus roratus*, the Red-sided, and ten subspecies of which only *E. roratus roratus* known as the Grand, and *E.r. vosmaeri* are usually available in the U.K.; although some of the rarer subspecies are no doubt resident here in various collections.

These beautiful birds mainly inhabit New Guinea, and many of the islands, including the Solomon Islands, in that part of the world, also parts of the Cape York Peninsula of North-Eastern Australia.

One of the outstanding features of these birds is their extremely obvious sexual dimorphism. The cocks of all species of Eclectus are rather similar, a predominantly rich green, with massive under-wing areas of varying shades of crimson or scarlet, the primary feathers of their huge wings a deep blue, turquoise to sky blue and crimson on the bend of the shoulder, tail green above and black below - all set off by the huge orange



Dulcie Cooke

Hand-reared Vosmaer's Eclectus Parrot

and rosy red beak and the large expressive eyes which, in an adult cock, are a light orange.

Young males have brownish beaks which change colour slowly over several months, and young females have black beaks. The hens of the various subspecies are in some cases easier to identify. The Red-sided Eclectus *E. roratus polychloros* is of a somewhat subdued shade of dark red, with blue to purple on parts of her front. It is she who has the distinctive blue eye ring. The Grand *E. roratus roratus* is also of a rather dark red and purple, but with a tail tipped with gold.

In *E.r. vosmaeri*, which is the third subspecies usually available in the U.K., the red of the hen, especially a young hen before she starts to breed, is of such a rich and dazzling hue as to be quite startling. Her wholly purple lower breast and underparts are of exceptional intensity of colour, and to adorn all this beauty still further, her bright red tail has a huge band of deep gold.

Eclectus hens have black beaks, even as babies, and the eyes are a paler shade of orange than the cocks, in some cases no more than yellow. When excited their eyes can appear very large and almost white.

The weight of males can be 15-20oz (450-600g); the females can be heavier at about 16-21oz (475-625g). The average length is about 13-14in (33-35cm).

These birds enjoy sunflower seeds and pine nuts but the latter should be treated with caution as, though they can often be shiny and perfect on the outside, the inside may be absolutely useless, just green-grey dust. Eclectus are very fond of peanuts (groundnuts, monkey nuts) but these are best fed as kernels, cooked with soaked pulses for one minute. Few birds are greater gourmets than Eclectus, their normal diet, which is fed fresh twice per day, consisting of a bowl of about a level tablespoon of brown bread and milk, squeezed out and crumbled, and a large tablespoon of mixed pulses which have been soaked overnight, then boiled for one minute. to which have been added a few peanut kernels. Once per day, about half a yolk of hard-boiled egg is added.

To the above basic mixture a whole range of food is added, such as well washed and cut up grapes, peeled and cored sweet apple cut up, pear, and when in season pieces of pomegranate. Orange and grapefruit are never given; these fruits do not appear to agree with Eclectus. Avocado pear is *never* given to the birds; although it has been said that it is only the skin which is so poisonous to parrots, we prefer to be safe rather than sorry.

Our soft food bowl often contains a few sultanas, or raisins, also shelled walnut pieces and shelled Brazil nuts, cut up, plus shelled almonds and hazel nuts. Needless to say, these foods are not all given together but rather as little extras. Sugared pieces of strawberries and raspberries are enjoyed too, but a special favourite is a small piece of digestive biscuit, also little bits of cheddar cheese. Some Eclectus like prawns very much, but we stopped giving them when they became so very expensive - also they do attract flies.

It is not always realised that these birds do enjoy a drink of honey water sometimes (a dessertspoonful of liquid honey to a teacup of boiling water); when they are breeding the cock seems to appreciate this about once a week.

In their wild state, Eclectus are high tree dwellers, and tend not to consider anything that has dropped to the ground to be edible. Once on the ground it is dirty, not to be touched. I know of one pair who will not feed a chick if it should lose its grip and fall to the ground. Perhaps this is

a 'throw-back' to the wild, where obviously a chick must be strong enough to keep its grip on a perch once fledged. I have not heard of such behaviour from any domesticated Vosmaer's.

One unfortunate thing about Eclectus is that even when they attain breeding age at between three to five years, they take a long time to learn how to bring up their young. The mother of the hand-reared bird who is the subject of this article, first laid at two years old, but the eggs were not fertile until the cock reached the age of five years. Fortunately he would go down into the nest of the hen, usually considered very necessary if breeding is to be successful.

During the summer of 1988, our birds' fifth year, the hen laid eight eggs, in batches of two at a time (a normal clutch). All the eggs were fertile, all hatched except one, and the hen killed five chicks. We think the reason may be twofold. Firstly, like many Eclectus hens she had a very 'jagged' lower beak, which is trimmed in the winter but had grown again at a time when she could not be disturbed. This may have presented great difficulties for her with tiny, newly-hatched chicks. Secondly, Eclectus chicks in the egg 'talk' to each other as they develop - we have heard them in one of our incubators! This may have mislead an inexperienced young 'mother-to-be' to assume that they were ready to hatch and perhaps needed help, long before this was, in fact, the case. Hence a number of chicks prematurely 'hatched'. Perhaps she broke the shells open.

Towards the end of the summer I could stand this carnage no longer, took two eggs away and put them in one of our incubators, with a temperature of 37.5°C and humidity at 50%. They duly talked to each other! One hatched but died almost immediately; the other, weighing just 17g when just hatched, was made of tougher material.

'Robbie' had been fed with boiled, luke warm water and glucose while still in his shell and took this readily from a spoon. Hatching lasted 30 hours during which time I helped him by carefully peeling away small bits of the rather tough inner membrane, with which he was having difficulty; it was preventing him from turning within the shell. With this small help, plus the feeds of glucose and water, his hatching was straightforward. This took place on 10th August 1988, and immediately on freeing himself of the shell, he was placed in a second incubator which was more suitable as a first 'brooder'. For those who are interested in incubation it is necessary to state that the yolk sac was fully retracted on hatching; also at this time his weight was recorded on digital scales. Thereafter he was weighed before feeding daily for a very long time.

The first real feed came with a tiny quantity of Boot's baby food, 'Mixed Cereal Breakfast' being added to the glucose and boiled water. The food was of the consistency of very thin, skimmed milk. This was given

about four hours after hatching and thereafter he was fed every two hours, with the exception of the night, when the last feed was at 12 midnight. The first feed of the next day was at 3 a.m., then 6 a.m. and back to every two hours. This went on for the first 12 days, then the 3 a.m. feed was cut out and the last feed was given at 12.30 a.m. and the next one at 5.30 a.m., then every three hours round until 12.30 a.m.

For the first ten days the chick was always given a warm, wet finger to induce normal feeding. All food from the egg onwards was given by means of a tiny spoon, the average 'feed' being one mouthful. All food was cooked fresh each time for at least two minutes in a cup standing in boiling water. The temperature in the brooder was brought down to 34°C at this stage.

In the early stages the food consisted of three parts Boot's baby food 'Mixed Cereal Breakfast', one part Milupa 'Autumn Fruit Harvest', half a part of ground rice, and one-eighth part of Bemax with wheat germ, this latter amounted to a large 'pinch'. The food was of the consistency of ordinary milk, or in terms of percentages, about 30% solids and 70% boiled water.

At ten days old, half a part of oat bran and oat germ (from health food shops) was added to create more roughage, and the consistency was somewhat thicker, but after a day or two this was stopped as it did not seem to suit the chick, and the Bemax wheat germ was increased to a quarter part.

It was at this time that near-disaster struck in the form of an electricity cut in our area. Fortunately it was during the day and was noticed quickly. A hot water bottle wrapped in pieces of blanket saved the little bird. By this time the Brinsee incubator 'brooder' had to have a wooden extension on top to raise the heat source for the growing baby.

At 16 days old the heat was reduced to 32.5°C. The food was as before, but gradually the solid content was increased. Three mouthfuls of food were given at each feed. Tiny slits appeared in the eyes. At 18 days one eye started to show, and two days later both eyes were little slits and the young bird seemed able to see dimly.

At 21 days, Cédé rearing food was introduced. All seeds were removed and it was sieved and then pre-soaked for at least three hours in just enough water to make it completely moist; this caused it to expand considerably. This was only given for two feeds per day and at the rate of about a quarter of one part to the slightly under five parts comprising the whole.

After two days' trial, the Cédé was given in all but two feeds; by this time the consistency of the food was brought up to at least 50% solids. At this stage it is necessary to say that the chick was always surrounded in the

early stages with enough tissues to ensure that his head was kept upright, and at night he had one or two tissues placed very lightly on top of him, to simulate a brooding hen. He seemed to like burrowing into these tissues at night. The boxes which contained him were becoming progressively larger now.

At 27 days the chick was covered with mid-grey coloured fluff, indicating a male, females having darker fluff. At this time the last feed was at 12 midnight and the first in the morning at 6.15 a.m. At 31 days his eyes were fully open and he was very lively at feeding times, wanting to play.

When Robbie was about 4 weeks and three days old, the temperature was lowered to 31.5°C and feeds were every three and a half hours. He was taking his first wobbling steps and the beginnings of quills appeared on top of his head. At this stage, Milupa 'Harvest Muesli' breakfast was added to his diet at the rate of approximately one part, bringing the whole up to nearly six part. This muesli seemed to provide him with the roughage he needed and was very satisfactory. The consistency of the food was that of fairly thick porridge, 60-70% solids.

At the age of six weeks the young bird had outgrown his original brooder, and was placed during each day in a large box in a home-made wooden brooder with the thermostatically controlled heat source coming from a removable plywood roof which was placed across the top of the wire-fronted brooder. He was protected from the lights at night with the aid of another cardboard box, partly cut away to form a 'roof' over the area where he slept, a structure hardly designed to please my Chartered Engineer husband, but it worked beautifully!

The front part of the brooder box had clean pieces of white paper, changed twice per day, and laid out with tiny twigs of hazel nut, soaked and cut up sunflower kernels, cooked garden peas and cooked sweet corn cut up, grated carrot and tiny bits of lettuce and cress, also very thin, small slices of cuttlefish 'bone'. Between six and seven weeks old he was being fed four times a day and it was difficult to get him to eat enough because he was trying to feed himself.

By the age of two months and a few days, the temperature was brought down to about 26°C (75°F), and the young bird was allowed to explore the whole of the very large brooder-cage, only being put back in his inner box at night, something he very definitely wanted himself; he cried out if he was not 'put to bed'! At nine weeks old he was walking about the brooder cage, flapping his wings, and eating quite a lot of food himself. He knew his name well by this age, always 'answered' when spoken to and was learning to step on and off the hand when told.

At ten weeks old the young bird was learning to fly and would occasionally say 'hello'. Two weeks later, at three months old, he could fly

quite well, and by three and a half months old he was 'zooming' up and down stairs, round corners, etc., with incredible ease. His huge wing span and long body gave an almost hawk-like impression of grace and beauty.

It was at about this time that we transferred Robbie to a medium-sized parrot cage (0.46 x 0.46 x 0.51m high) with a small 250w electric fire at night when the house central heating went off. We tried not to let the temperature go above 70°F or below 60°F. This cage was to be his home until he reached the age of about ten months, when it would be summer and he could be transferred to his permanent home, an aviary with a large flight, a large interlined house with light and some heat for the winter.

For his first winter in an outdoor aviary we shall endeavour to avoid the temperature going below 50-55°F. His parents, now five and a half years old, have withstood temperatures as low as 40°F for days on end; ours is a cold part of South-Eastern England. However, we would not wish to subject a very young Eclectus and especially any female *vosmaeri* that we are lucky enough to obtain for our bird to such low temperatures during their first winter together.

At the time of writing (April 1989), Robbie is eight months old, talks extremely well and is rapidly increasing his already considerable vocabulary. The beautiful rich green of his upper wing feathers is attractively edged with deep blue, a variation from his father's pure green. There is also some mid-blue edging to the green tail feathers. His beak is now the rosy orange of an adult bird, but his eyes are still black. When last weighed about five or six weeks ago, he weighed slightly over 14 oz.

His food now consists of brown bread and milk squeezed out and crumbled, mixed pulses soaked overnight and then cooked for one minute, with peanut kernels added just as the water comes to the boil. His soft food bowl also has sweet apple, which is peeled, cored and cut up, two or three well washed or peeled grapes cut up, and once per day half a teaspoon of hard-boiled egg yolk. This food is given fresh twice per day. Lettuce, endive or watercress are given once per day, and on alternate days a piece of celery or carrot. Extras added to the food are cut up shelled walnuts, brazil nuts, hazel nuts, or almonds, also small pieces of cheddar cheese, sultanas and raisins.

Naturally a bird living at present in a cage in the house and only let out twice per day for exercise is bound to be spoilt with 'bits' from the table. But he has never been given meat, fish or poultry of any kind. He has tried many cooked vegetables, most fruits, and some buns, cakes, biscuits, etc. Chocolate is strictly forbidden!

I have found the hand-rearing of this highly intelligent and now beautiful bird one of the most rewarding experiences of my long association with aviculture. But let no one underestimate the effort involved in

feeding a young bird, day in - day out, nights included. There are now (thank goodness!) a number of establishments specialising in incubation and hand-rearing. Robbie's sister from a later clutch was taken as an egg and handed over to Judith Nicholas of Databird Worldwide. Her superbly run organisation brought back in due course a lovely young hen, beautifully reared, tame, confident and talking. All credit to Sue Ingles's care and attention.

Interesting as the experience of rearing Robbie has been, I feel that this is really a task for the experts, those specialising in this branch of aviculture.

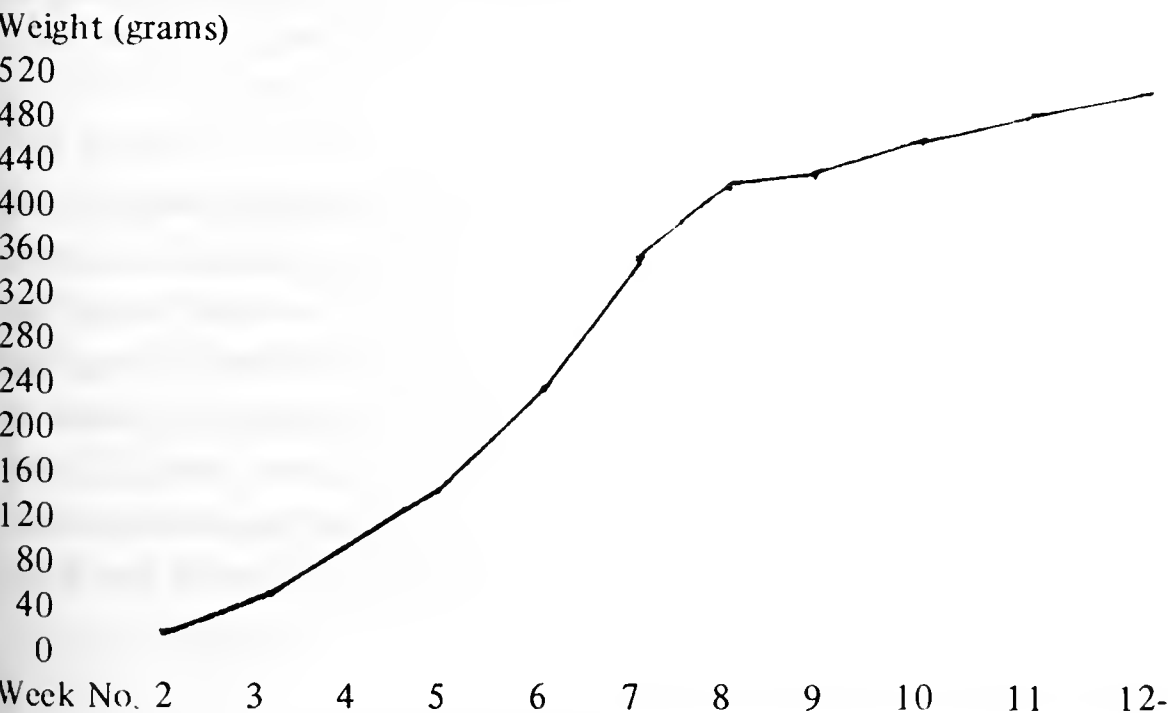
We hope very much that Robbie's egg-laying mother will soon learn to rear her young, but we know now that if she fails in her task, we can hand over at least some of the eggs to the experts.

For those who are interested in relative weights of a hand-reared Eclectus, a table and graph show the progress of our young cock.

TABLE 1: *ECLECTUS VOSMAERI*. WEIGHT GAIN IN FIRST FOURTEEN DAYS. WEIGHT AT HATCHING 17 grams.

DAY	WEIGHT (grams)	DAY	WEIGHT
1	18	8	29
2	19	9	30
3	20	10	27
4	21	11	28
5	23	12	29
6	23	13	30
7	28	14	34

TABLE 2: GRAPH OF WEIGHT GAIN OF *ECLECTUS VOSMAERI* FROM TWO WEEKS TO FLYING AT 12 WEEKS



HAND-REARING AN AFRICAN WHITE-FACED OWL

Otus leucotis

By HILARY TYE
(Huntingdon, Cambridgeshire)

On 2nd February 1981, an African White-faced Owl was brought to the Zoology Department of Fourah Bay College (University of Sierra Leone), Freetown, Sierra Leone. We photographed the bird (wearing a gardening glove as a precaution) with the intention of returning it to the wild immediately. However, the bird appeared unwilling to fly, was very docile and sat unmoving on the ground. It was easily recaptured and, on closer examination, was found to have the buffish-brown plumage tones of juvenile and immature birds (whereas adults are greyer) and lacked the blacker crown and nape of an adult (Bannerman, 1933). As it seemed unable to fly, we decided to keep it until it could fend for itself.

Bird trapping is not common in Sierra Leone and the owl was probably found by chance. If a natural hole in a tree is not available, White-faced Owls use the old nests of other birds, even small ones of pigeons, sparrows or waxbills, between 2-8m above the ground, and the young often leave the nest at about 27 days old and sit on adjacent branches, although they cannot fly properly until 30-31 days old (Kemp, 1988).

From its plumage and behaviour, this bird was probably about 27-31 days old. It may have fallen from a nest tree or, being outside the nest, may have been spotted by a passer-by, from whom it could not escape by flying. Laying dates for White-faced Owls have been recorded in Sierra Leone in January and in Nigeria in October and from January to March. The egg from which this bird came was probably laid at the beginning of December, as incubation takes about 30 days (Kemp, 1988).

Accommodation

In order to observe its development, the owl was initially kept in our spacious living room. It spent most of the day on a perch about 1 m above the ground, the top being a 30cm square of thick wire to which was tied a platform of split palm petioles (as used for making matting). It was not necessary to tether the bird as all the windows were covered by security mesh. Later, when the owl had become a stronger flier it wreaked too much havoc in the room after we had retired for the night, so it was then carried on the hand to an empty room in the servant's quarters last thing at night, to spend the dark hours there.



Alan Tye

White-faced Owl with unusual prey

Food

Wild White-faced Owls catch a variety of small mammals, birds and insects and require about 25g of food daily (excluding indigestible parts), 11-13% of their body weight (Hanmer, 1981). They also hunt at bush fires during the day, to catch small rodents trying to escape the fire (Bannerman, 1933). Our closest approximation to wild food, cubes of raw beef a little over a cubic centimetre in size, were initially ignored so, after a few hours, they were given to the owl by holding its beak open and pushing a chunk well in. The bird soon graduated from force-feeding to voluntarily accepting chunks touched against its beak. A few pieces of meat (replaced at intervals) were left on the bird's perch but were not taken for the first few days. About eight to ten such cubes (about 20g) of lean beef were consumed per day.

We found a similar diet successful with an injured West African Wood Owl *Ciccaba woodfordii*, so much so that it managed to escape before its intended release date!

After about two weeks there appeared a means of varying the owl's diet and easing our expenses. Large brown beetles (family Scarabaeidae)

about 2.5cm long began flying into our verandah and lit rooms during the evening and were readily accepted by the bird. At first they were proffered by hand, then the owl learnt to snatch them live from its perch and, finally, they were hunted on the floor, having been placed 1-2m from the perch. After another week, geckoes *Hemidactylus* sp. were introduced into the hunting training. They were at first held, wriggling, near the perch until the owl had obviously noticed the movement. Spotting of food was characterised by a definite head orientation towards the prey, then circular movements of the head in a vertical plane, presumably to help fix the position of the prey. This was followed by a sudden dive to the floor where it grabbed the beetle or lizard in its talons, then pecked with its beak. Towards the end of March, eight weeks after we received the bird, it was capable of capturing geckoes released near its perch. These were herded at first and where necessary, to keep them in range while the owl peered at them from its perch.

As must be common with young birds learning to feed themselves, mistakes were sometimes made. One afternoon, while I was sewing at a table about 2m away from its perch, the owl suddenly pounced on my twiddling fingers (but was unsuccessful in its prey capture attempt). Another time, on 31 March, it pounced on a black ball-point pen top and flew with it back to its perch. The cap had to be gently removed from its beak, as the bird made no move to drop the object.

Prior to its release in early April, the owl was well able to spot, capture, dismember and consume live, mobile prey (beetles and geckoes) but this was still supplemented by raw beef. Apart from the incidents described above, it did not attempt to explore other potential food sources, although it 'worried' the cheesecloth curtain adjacent to its perch.

Water was not supplied after the first few days. Spicknall & Pickett (1983) found that it was not taken by a Striped Owl *Rhinoptynx clamator* being exploited rather for bathing, as noted also by Oniki (1984) for a Tropical Screech Owl *Otus choliba*. Sayers (1981) stated that many owls are avid bathers and should be given a large container of water, but it seems unlikely that our owl, during its relatively short period in captivity, suffered from lack of a bath! We never saw it drink during the first few days when it was provided with water.

Flight

The owl made no attempt to fly for the first few days, but soon began to explore the room, walking along the window ledge beside its perch then flying short distances. Within about a week it could fly more strongly, up to the top of a door, and also climbed the window mesh to the pelmet. About two weeks after it arrived, we carelessly left the front door

open in the early evening and it flew, low and unsteadily, to a *Cassia* tree about 30m away. Since at that stage it could not feed itself or fly very well, we hurriedly recaptured it with a cloth bag on a long pole (normally used for picking avocados).

White-faced Owls are predominantly nocturnal and this bird did most of its flying after dusk, despite the artificial room lighting. It spent most of the daytime on its perch, inactive, usually with closed eyes, but also had periods of preening and foraging. When approached, it became alert, but was tame enough to be picked up on a finger pushed against the back of its feet.

Vocalisations

The call of the adult of the West African subspecies *O. l. leucotis* has been described as 'a rather soft *kuy-cooo*' (Serle & Morel, 1977) or 'a disyllabic, mellow, fluting *po-proo* at 4-8 s intervals' (Kemp, 1988): this we did not hear. However, the owl sometimes made a slightly rising then falling purr, uttered at various pitches, and which we tape-recorded. This sound was sometimes made seemingly to itself, but occasionally seemed directed towards us. Certain noises also elicited another call: when an electric food grinder was operated in the next room or voices raised in its vicinity, it uttered a harsh, rapid (3-4 notes per second), high-pitched twittering. This was accompanied by a particular posture in which the bird made itself very tall, thin and stiff, pointing its ear-tufts and screwing its eyes up. This posture is described by Hanmer & Hanmer (1980) as being adopted by captive adult White-faced Owls holding food, when approached by a human. We also occasionally observed it in such circumstances, but Hanmer & Hanmer (1980) found it accompanied by squeaky growls, which we did not observe. Some wild White-faced Owls have also been reported as adopting a similar posture when a car passed nearby at night (Worden & Hall, 1978).

The incidents described by Hanmer & Hanmer (1980) and Worden & Hall (1978) concerned birds of the race *O. l. granti*, which occurs in southern and eastern Africa, as far north as southern Kenya and Uganda. The vocalisations of *O. l. leucotis*, of West and Central Africa, are quite different from those of *granti* (Kemp, 1988), which may explain some of the differences described above. The posture, which perhaps indicates mild alarm, seems common to both races, and is also adopted by the Common Scops Owl *Otus scops*, when approached; the effect in both species is described as astonishingly concealing in the wild, making the bird look like a 'rough-barked tree-trunk' (Hanmer & Hanmer, 1980; Kemp, 1988).

Release

Once the owl could fly reasonably strongly and catch all the prey we could supply, we decided to release it. It was placed about 3m above the ground in an avocado tree outside the window where its perch had been situated. This was done in mid-afternoon and a pot of beef chunks was fixed to the branch beside it. A few of these were eaten that day, but none thereafter, although the supply was replenished for a few days. After two hours in the avocado tree, it flew about 25m to a *Spondias* 'plum' tree, and sat on a branch about 10m up. One aspect of its training which we discovered we had neglected was a full introduction to its fellow animals. While perched in the *Spondias* it spent some time shaking first one foot then the other, not realising that the most effective way to avoid ants is to move elsewhere!

Towards dusk that day, the owl flew away and was not seen again, though we believe that we heard its call occasionally thereafter and hope that it stood a fair chance of being able to fend for itself.

ACKNOWLEDGEMENTS

Alan Tye shared in the care and rearing of the owl and gave considerable help in preparing this article.

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A SELF-CONTAINED PORTABLE CANDLER USED FOR MONITORING EMBRYONIC DEVELOPMENT IN AVIAN EGGS

By MICHAEL E. MACE
(San Diego Wild Animal Park, California, USA)

Introduction

Anyone who has managed birds has needed, at various times, to monitor embryonic development in eggs that have been produced by their birds. Candling is an age-old husbandry technique that entails shining a bright light into the egg so that the developing embryo can be viewed. Eggs can be monitored from birds that are incubating their own clutch, or eggs that have been set in an incubator. In the first case, monitoring development is a good tool to observe the progress of the embryo. But only if the parent birds are calm and tolerant of the disturbance created by eggs being temporarily removed so that they can be candled. Secondly, candling eggs during artificial incubation is a necessity. By making careful observations during the incubation period, we are able to determine many factors concerning the fertility of the egg, the correctness of the artificial incubation parameters and the health of the developing embryo. These determinations are based on candling procedures conducted periodically through the incubation period.

A candler used for making observations can range from a simple pen-light torch (flashlight) to the multi-featured electrical models (e.g. Lyon Hi-Intensity Egg Candler) with such features as varying light source intensities and adjustable light beam diameters. All of these candler have their strengths and their weakness in performing the tasks. The pen-light or torch version is popular because it is portable. But it is difficult to use in areas where daylight illuminates the area, because the egg must be covered with one's other hand to darken the egg. Another shortcoming is the limited light beam intensity. Most torch candler are adequate for candling eggs from Anseriformes, Psittaciformes and Passeriformes; however, eggs from the thicker shelled orders such as Struthioniformes and some Gruiformes can only be candled with a more powerful candler. In order to candle eggs with thicker shells, eggs must be transported to an electric candler if a power source is unavailable. Transporting eggs can be risky and leaving the nest with the eggs can result in the parent birds abandoning the nest. It is said that 'necessity is the mother of invention' - this case is just such an example.

Because of the widely diverse species of birds at the San Diego Wild

Animal Park, ranging from Struthioniformes to Passeriformes, a portable candler had to be designed so that proper data could be collected from eggs found anywhere in the Park's 1800 acre facility. The candler had to combine the beneficial features found in the electrical and torch versions. Additionally the candler had to be somewhat rugged because of some of the rough terrain travelled when visiting each nest site.

Materials

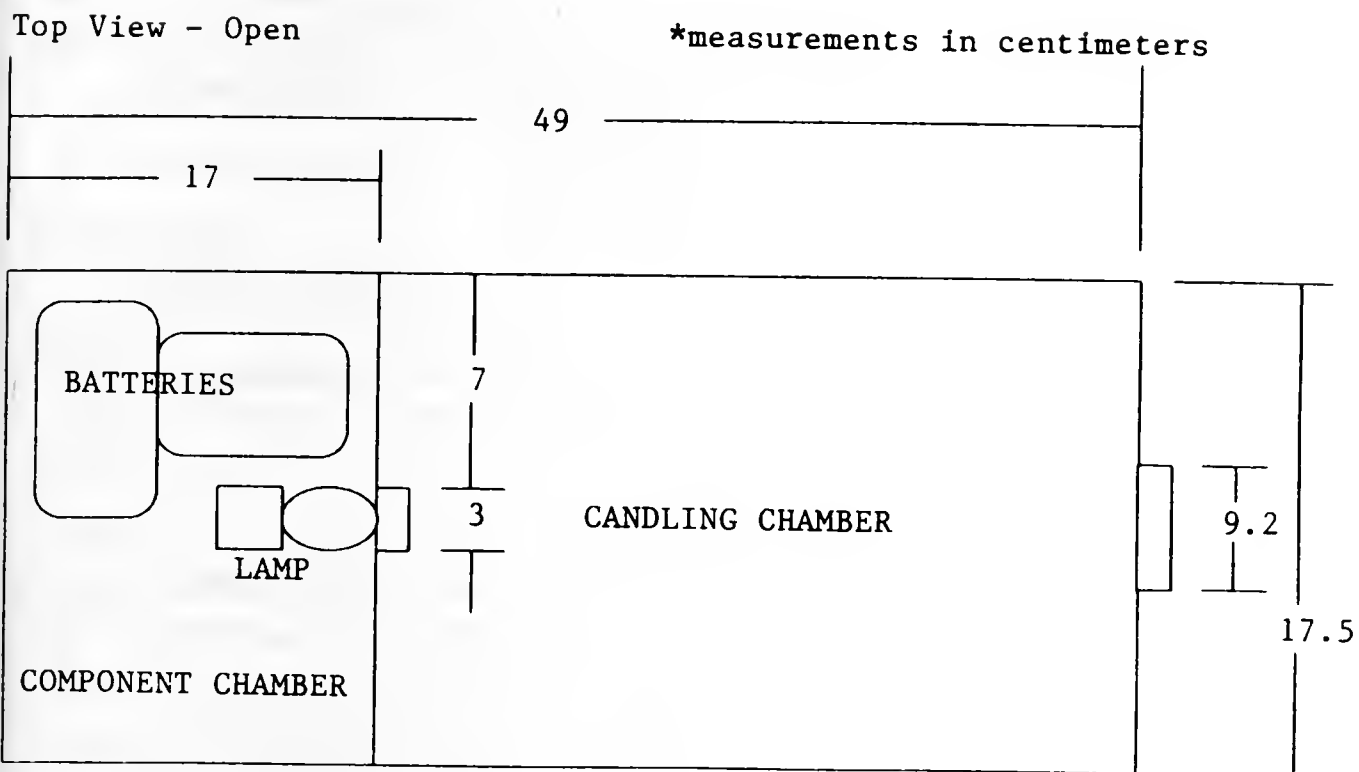
The module consists of three basic components: the protective outer shell, candling chamber and the electrical apparatus (Figure 1). A standard utility box was chosen because of its strong durable outer shell which is constructed of a steel alloy. The exterior size of the box was determined by the absolute minimum amount of space needed to house the candling chamber and the electrical components. In this way all available space is used which makes the entire unit compact.

The candling chamber was designed to provide flexibility for candling the largest to the smallest eggs, from Ostrich to hummingbird. By incorporating data regarding various egg dimensions the chamber size was determined. The material for the floor of the chamber is made of foam rubber which serves as a shock absorbent cushion and the convolutions in the material aid in the prevention of eggs rolling around once placed on the chamber floor. The only protrusion inside the chamber is the light source which is also padded to minimise the risk of damage to the eggs.

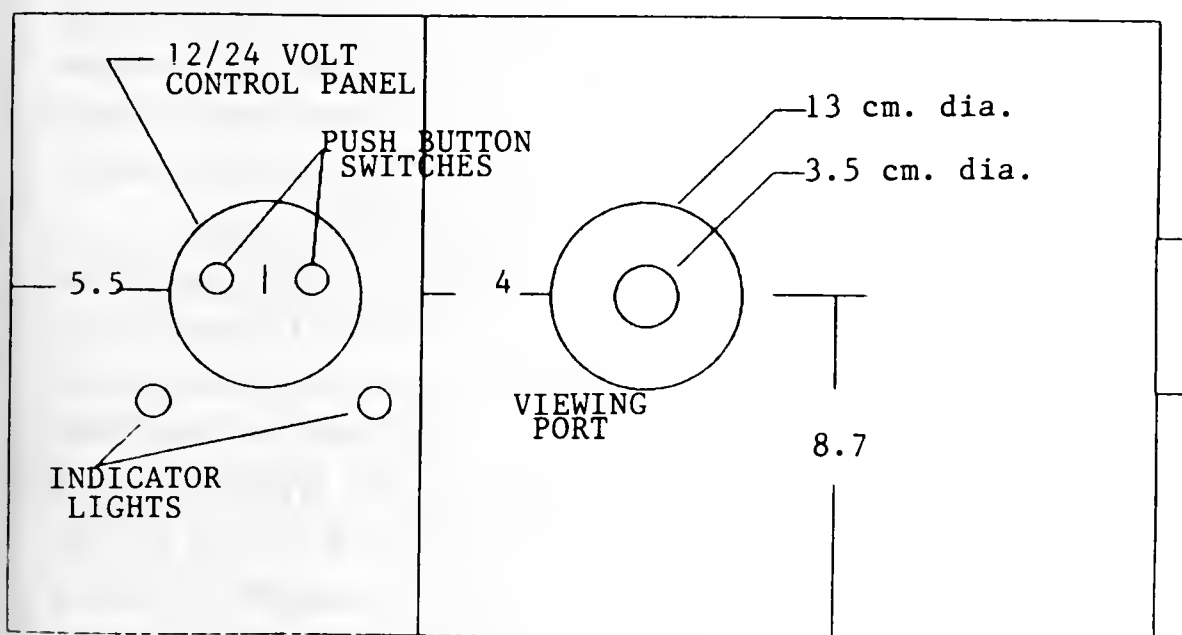
Lastly, the electrical components are made to give the candler two light beam intensities. The 12 volt beam is used for eggs that are thin shelled and by using the reduced beam, the risk of over-heating the embryo is minimised. The 24 volt beam is used for the thick, dense shelled eggs. Discretion must be employed as prolonged exposure during candling to a concentrated heat source can be detrimental to the embryo (Brown, 1979).

The control panel consists of a single toggle switch, two push button switches and adjoining monitor lights. The toggle switch allows the operator the option of choosing between the 12 and 24 volt light beams. The two spring loaded push buttons activate the light source only when the button is depressed, thus acting as safeguard so that the lamp cannot be mistakenly left on to deplete the batteries. Also the lamp is only activated when the button is depressed, which allows the lamp to cool between candlings. The interior portion of the electrical control panel is illustrated (Figure 2).

FIGURE I
(Diagram by Michael E. Mace)



Top View - Closed



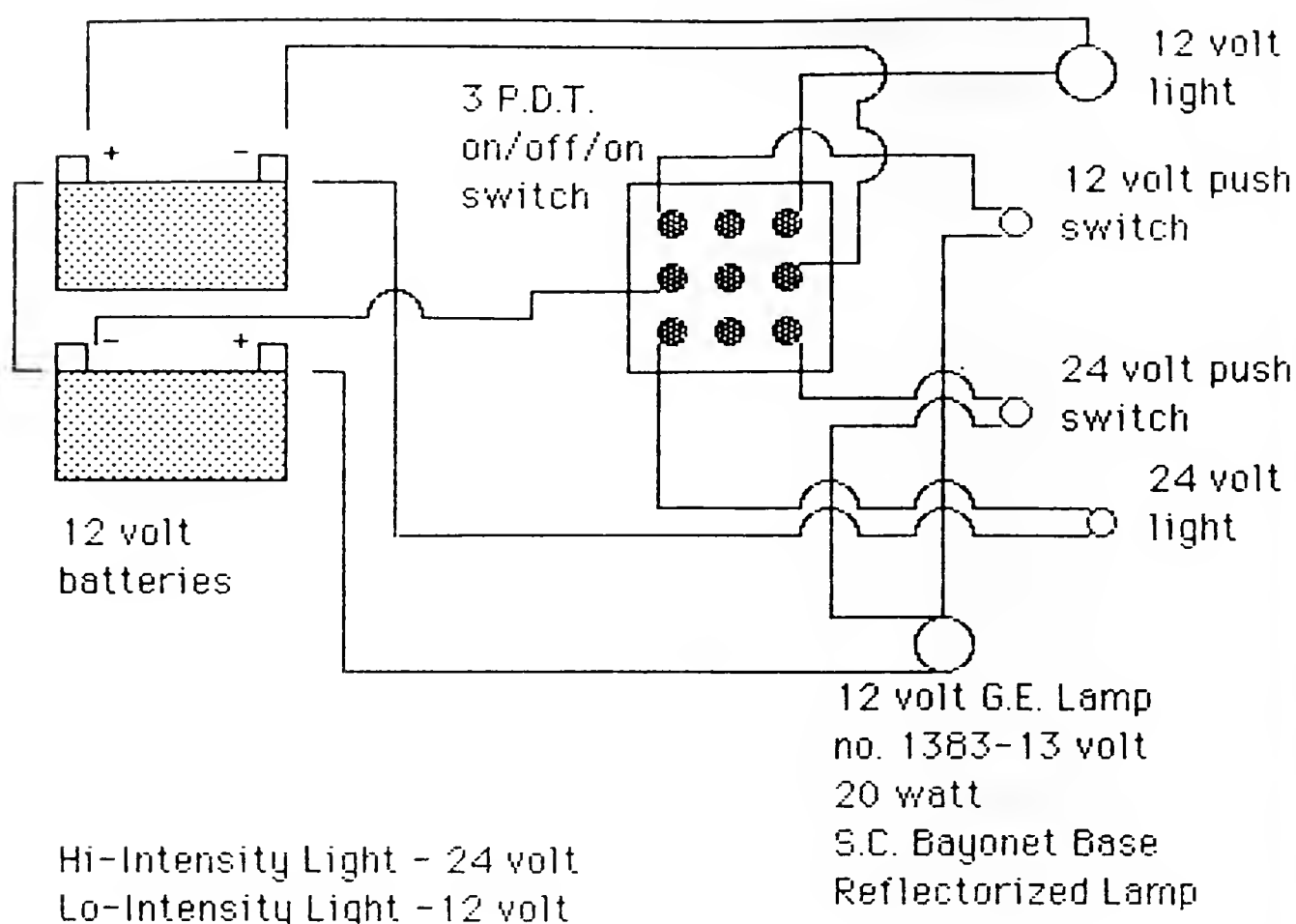


FIGURE 2: ELECTRICAL CONTROL PANEL FOR PORTABLE CANDLER
Diagram by Daniel King

Method of Operation

First the candler is placed on a stable, level surface. The operator then chooses from a series of rubber grommets for a size which affords the best fit between the lamp and the egg. Depending on the diameter of the egg to be candled, a rubber tube is equipped with interchangeable rubber grommets (ranging from 1cm to 3cm) which provide the proper fit around each egg, thus concentrating the light beam.

Gently the egg is placed in the candling chamber. The reason for placing the egg in the candler first is to reduce the risk of breaking the egg in your hand while attempting to insert both hand and the egg into the hand port at the end of the candler. Once the egg is in the chamber, the operator's hand is placed back inside the chamber. When the inner lid to the candling chamber is closed, the operator's eye is at the viewing porthole so that the area, even in bright sunlight, remains darkened. The lid is then closed. Based on the type of egg being candled, the operator can choose between the 12 and 24 volt power sources simply by turning the toggle switch to the appropriate position. The egg is placed up to the light bulb which is encased by a rubber tube

which prevents the egg from coming into direct contact with the lamp. While looking through the eye piece in the top of the lid, the push button is depressed, activating the lamp.

The control panel is regulated by the left hand as the egg is viewed in the darkened chamber. Gentle rotation of the egg aids in determining the egg's developmental status (common knowledge). The egg is again carefully laid down, the hand removed and the lid opened. This process is repeated as needed.

Results

Since the portable candler was first developed in 1987, it has been used extensively for many species of avian eggs at the Wild Animal Park except in the incubation facilities. The candler can detect embryonic development in the eggs of those species which can be realistically candled. For eggs which cannot be candled because the shells are too thick or dense (e.g. Red-crowned Crane *Grus japonensis*) radiographing the egg when it is near hatch represents an alternative method. Additionally, hatching facilities at the San Diego Wild Animal Park are equipped with an electric candler (Lyons Hi-Intensity candler, Catalogue No. 950-76). Using the portable candler in the candling room may increase the risk of cross contamination of pathogens such as *Pseudomonas* acquired during field work which can be detrimental to the eggs already in the incubators. For this reason both the portable and the electric candler are used.

ACKNOWLEDGEMENTS

This project could not have been made possible without the efforts of Daniel King, senior electrician, San Diego Wild Animal Park, to whom I am indebted. I wish to thank also Cyndi Kuehler, zoologist, Zoological Society of San Diego, for comments on an earlier draft.

PRODUCTS MENTIONED IN THE ARTICLE

Lyon Hi-Intensity Egg Candler, manufactured by Lyon Electrical Company, P.O. Box No. 81303, San Diego, California 92138, USA.

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NOTE ON THE LASTING RESPONSIVENESS OF A KEA
Nestor notabilis TOWARD ITS MIRROR IMAGE

By Drs. JUDY DIAMOND & ALAN BOND
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A mirror image has long been known to influence the social behaviour of birds. Mirror image stimulation is considered an effective and consistent way of provoking prolonged bouts of threat display (Gallup, 1968; Serpell, 1982). There is also evidence that it can have a quieting effect on some birds (Andrews, 1966). Gallup and Capper (1970) showed that some birds will actually prefer a mirror image to conspecifics, a preference that increases over periods of up to 18 days.

At the San Diego Zoo we had the opportunity of observing the behaviour of a Kea *Nestor notabilis* toward its mirror image under conditions of constant exposure over a period of 12 months. Keas are highly social birds, living in flocks of up to 13 animals in mountain forests on the South Island of New Zealand (Clark, 1970). They have been bred successfully in a number of zoos (e.g. Schmidt, 1971; Mallet, 1973; Mitchell, 1981; Sieber, 1983).

In June of 1987, a previously paired eight-year-old male Kea was transferred from the San Diego Wild Animal Park to a solitary cage in the San Diego Zoo to await the arrival of additional Keas from New Zealand. After several weeks in the new location the bird appeared listless, but repeated visits to the hospital provided no indication of parasites or other illness. He remained hunched with his feathers fluffed for long periods and began to pull out his scapular feathers.

On 27th September 1987, we introduced two stainless steel mirrors into the Kea's cage. During the first two weeks the Kea displayed a broad range of responses to the mirrors. From the moment they were in place, the bird went up to them and examined his own reflection. The examination involved a series of brief glances toward the mirror image followed by gaze aversion. Initially, the bird appeared mildly aroused, displaying a partial erection of the crown feathers and an erect stance. Later, the Kea's contact with the mirror consisted of periodic, tentative touches with the bill. The mirrors also appeared to elicit 'marking' behaviour (described by Keller, 1976, at the Zurich Zoo), in which the cheek area between the cere and the orbit is rubbed repeatedly along the substrate.

By the afternoon of the third day, the bird exhibited a different suite of behaviours to the mirrors. He was observed to move deliber-

ately in their vicinity, with his gaze maintained downward and his feathers fluffed. These postures are components of submissive displays, given by subordinate to dominant individuals (Potts, 1977). On the fourth day after introduction, however, the bird was observed to spend his afternoon rest period by preference on the perch next to the mirror, periodically waking up and touching his bill to that of the image.

Twelve months after the initial introduction, the Kea continued to be interested in and to interact with his mirror image, displaying primarily non-aggressive social behaviours. He spent a considerable amount of time looking at himself in both mirrors and commonly slept on the perch in front of one of them. The bird would stand next to either mirror with his body in contact, stare into it, touch it repeatedly with his bill, look away and then repeat the actions. Sometimes he vocalised while touching the mirror, a *meow* call we have observed in juvenile Keas in the field. He then typically adopted a resting posture, remaining in full body contact with the mirror.

The introduction of the mirrors appears to have had a striking impact on the bird's listless state. Reports from keepers indicated that the Kea's appetite was restored after the introduction of the mirrors, and the animal was generally more active. Incidents of feather pulling were generally reduced in frequency. At the end of the 12-month period, the mirrors were removed from the cage and the Kea was introduced to his previous mate. Within 48 hours of the introduction of the female, normal courtship and mating behaviour were observed.

Although mirrors are clearly not a substitute for the company of conspecifics, these observations suggest that the introduction of mirrors can be an effective way to maintain responsiveness in temporarily isolated individuals of highly social species.

ACKNOWLEDGEMENT

We wish to thank Alan Lieberman and Wayne Schulenburg of the San Diego Zoo for their assistance on this project.

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BIRD ACOUSTICS IN RUSSIA

Tapes of birds and other animals in the service of pure and applied Soviet science

By JEFFERY BOSWALL
(Birdswell, Wraxall, Bristol)

PART 1

My hero of the Soviet Union is Boris N. Veprintzev, bioacoustician extraordinary. He has recently - 1985 - celebrated the completion of a quarter-century of work: taping, archiving and analysing sounds of animals. He is the founder of the Soviet Archive of Wildlife Sounds of the USSR Academy of Sciences, and is compiling what could be called the Great Soviet Encyclopaedia of Bird Songs - a work of immense scientific significance. At the other extreme, he has produced pop discs of nature's chorus in a Russian birch forest that have sold two million copies. This gentle, cultivated father-of-three has wide interests beyond the voices of the wild. Indeed his work as scientific director of the archive is part-time - so many hours a week supervising the staff and two months each year in the field capturing on tape the voices of the wild. Boris's main job in life is as professor of biophysics at an institute in Puschino-on-Oka, a small 'science town' an hour's drive by the new road out of Moscow. But I suspect that his first love is his scientific involvement with the sounds of nature.

When I first met him, 25 years ago, he was almost alone among about

250 million Soviet people in his passionate interest in registering for science, for the people and for posterity, the voices of the Soviet wilderness. Today 'bioacoustics' has really caught on in Russia: in science, in education, in economics - and even in art. As we shall see.

Economically, to get on the same wavelength as an animal - literally - by playing back its voice to its congener in the forest can sometimes give you a degree of control over that animal. A municipal official might be able to repel Starlings *Sturnus vulgaris* with a dispersal cry. A hunter can get a game bird to give away its position with its reply. A commercial sea fisherman dreams of coaxing fish into his net by 'talking' to them. The prospect of all this really tickles the Soviet fancy.

But as is usual with scientific work, the 'pure' enquiry usually has to precede the subsequent 'application'. Scores of 'pure' scientists are involved, and as might be expected in Soviet Russia many women have played a significant role.

As long ago as 1963, the famed and formidable Leningrad ornithologist, Irene Neufeldt, went on an expedition to the Soviet Far East - the USSR, easily the largest country on earth, has 11 time zones - and taped birds' voices. 'My very first was *Caprimulgus indicus* (the Jungle Nightjar)', she told me, 'but my best and most beautiful was the song of *Monticola gularis* (the White-throated Rock Thrush)'. These two recordings, and others, were made in the Amur region near Komsomolsk. (The Amur is the great river that forms a boundary with China.) Resident in nearby Vladivostock is Natasha Litvinenko who has studied the voice of the Black-tailed Gull *Larus crassirostris* on Russia's Japan-facing coast. North of there, in the Sea of Okhotsk, T.Yu. Lisitsyna taped the voice of Steller's Sea Lion *Eumetopias jubatus* and related what she heard to the behaviour she saw. Irene Boehme (whose father, grandfather and great grandfather are or were also ornithologists) has also gone east to the Amur region. Her task was to tape the vocal repertoire of a good-looking bird called the Daurian Redstart *Phoenicurus auroreus*. She found that the species' vocabulary consists of eight different calls (three of which are used only by nestlings and fledglings) plus the song of the adult male. She can give you a 'translation' of each utterance.

The first Soviet scientist to tape sounds produced by fishes, wild and free under the surface of the sea, was Elizabeth V. Shishkova. She recorded the sounds created in the Black Sea by drum-fishes (Sciaenidae) which vibrate their swim bladders to create a noise. It had been hoped at one stage that the play-back of fish sounds might have helped fishermen to catch them, but fish communicate at such short range that it proved impossible to 'talk' them into nets. The dream was shattered.

Far from the Black Sea, but only an hour's drive south from Moscow,

is the Prioksko-Terrasny Biosphere Reserve on the bank of the Oka river. There, Marina Zablotskaya studies the voice of the Common Redpoll *Acanthis flammea*. It breeds not only across the breadth of the Soviet Union, but also in temperate North America. Ms. Zablotskaya found that this bird has as complex a repertoire as any other known bird species. She describes, and illustrates with 'voice prints' derived from her tape recordings, 22 calls, each with its own meaning. Also three types of song used by the cock bird: before pairing he has one tune, while courting a second, and once paired a third. The hen does not sing but has six uniquely female calls and nine that she shares with her mate. The male has four calls that only he utters. The remainder are used by chicks in the nest, and by fledglings until two months old. Obviously communication by sound must be of some importance in redpoll life for so sophisticated a language to have evolved. How can the Daurian Redstart get away with a vocabulary of nine sounds, not 25? The answer may lie in the greater colourfulness of the redstart. Much of its communication could be by visual means - by semaphore, not Morse code. The two species (a finch and a thrush) must have rather similar communicationary *needs*; but accidents of evolutionary history seem to have brought them to different *answers*.

The husband of the woman who studies the language of Steller's Sea Lion is Alexander A. Nikolsky. He, too, is a bioacoustician working on mammals. He earlier studied the vocal behaviour of the Elk *Alces alces*. More recently Nikolsky has climbed with his recorder above the tree line to enquire into the language of the Alpine Marmot *Marmota marmota*, a burrowing rodent. One of his students, Nicolai Formosov (the charming son of one of the USSR's most distinguished ecologists and gifted nature writers, A.N. Formosov), has been enquiring into the importance of sound in the lives of Pikas *Ochotona princeps*. Pikas are small mammals akin to Rabbits *Oryctolagus cuniculus* but with smaller ears. Other Soviet scientists like Eugene Panov (dubbed by some, the finest Soviet ornithologist of his generation) of Moscow's Institute of Evolutionary Ecology and Morphology, study the songs of wheatears *Oenanthe* - small specialised thrushes with white rumps. The croaks of amphibians interest B.D. Vasiliev and the stridulations of insects gain the attention of R.D. Zhantiev. Both men work at the Lomonsov State University on Moscow's Lenin Hills. The tape recorder is an indispensable item of equipment for all these workers, female or male.

But not all of them go in for species studies. Some may tape record the voices of half a dozen apparently closely related species - say, three kinds of cichlid fish (Cichlidae) as in the case of Igor Nikolsky - and use the differences and similarities in their language to help determine their phylogeny - geneology. Yet other workers may be interested in relating

the kind of sounds creatures of birch woods may make, as distinct from steppe dwellers, for one of several selective pressures put by evolution on the physical form of a sound is the acoustic environment in which it is created and through which it has to travel. It is not difficult to imagine the 'blanketing' effect that residence in a reed bed may have on the sounds of vocalisers like the Reed Warbler *Acrocephalus scirpaceus* that live there. Perhaps certain frequencies 'get through' better than others?

A young ornithologist from Lithuania, the westernmost (geographically and culturally) of the 15 Soviet republics, has become a specialist on the voices of gulls. He is called Pranas Mierauskas and is working for his zoological doctorate. So far he has taped in Lithuania the voices of the Great Black-backed Gull *Larus marinus*, Herring Gull *L. argentatus*, Black-headed Gull *L. ridibundus* and Common Gull *L. canus*. Also the cries of the Black-legged Kittiwake *Rissa tridactyla* north of the Arctic Circle near Archangel on the White Sea, and of the Slender-billed Gull *Larus genei* on the shores of the Black Sea to the south. Pranas has also climbed high into the Pamir Mountains (whose highest peak is also the loftiest in the USSR, Mount Communism, 24,690 feet - 7525m) to capture on tape the vocabulary of the Tibetan Gull *Larus brunnicephalus* at its only nesting location outside China. The Pamirs are in Tadzhikistan. In nearby Kazakhstan nests the Relict Gull *Larus relictus*, a bird unknown to science until 1968. There is a colony on Lake Alakol on the Soviet border with Chinese Sinkiang. The home of the Relict Gull is among Pranas' immediate objectives as are the marshes of the Kolyma delta in extreme north-eastern Siberia, the summer home of Ross's Gull *Rhodostethia rosea*, and the seabird 'bazaars' of the Soviet Pacific coast where the Red-legged Kittiwake *Rissa brevirostris* comes ashore each May to converse with its mate and rear its young. Within the borders of their country, it is comparatively easy for Soviet scientists to travel and since the USSR is 7,000 miles from west to east and 3,000 miles from north to south, there is a lot of choice as to habitat type and animal species.

To attempt 'translations' from the language of gulls is potentially important since these birds are among the most troublesome on airport runways, causing expensive damage to aircraft every year, and some deaths, as we shall later discuss.

To get on the same wavelength as the animal by playing back its own or the voice of another of its species can be a powerful tool.

Playback will usually work for a limited initial time, for example in keeping Rooks *Corvus frugilegus* off fields of winter wheat in Lithuania - or even Starlings out of the cherry orchards; but often a law of diminishing returns sets in as the creatures habituate to the sound.

Some birds have proved impossible to shift. Few are as immovable as

House Sparrows *Passer domesticus*, surely one of the world's most canny birds. Many sparrows winter in Yerevan, the capital of the Armenian Soviet Socialist Republic, where they are noisy and messy. But getting them to 'move along' has proved an intractable problem.

With keeping Starlings out of vineyards in Kazakhstan, however, Anatole Sema had considerable success as did A.D. Dzhabbarov in the neighbouring Soviet Central Asian republic of Uzbekistan. Dzhabbarov worked out of the zoology department of the University of Samarkand, the legendary city in Uzbekistan conquered in turn by Alexander the Great and Genghis Khan. Dzhabbarov recorded distress cries of the Starling to scare invading and hungry hordes of these birds from the grape fields.

E. Shernazarov had similar success keeping Common Mynahs *Acridotheres tristis* out of vineyards elsewhere in Uzbekistan, near the republic's capital city of Tashkent.

Tashkent is the third largest city in the Soviet Union, and its airport is correspondingly busy. Easily the most serious problem created for man by birds is the damage they can cause to aircraft that fly into them, and - less frequently - the human death toll that can result. Data on collisions with Soviet civil aircraft, let alone military planes, are difficult to come by, but Soviet openness about their research into possible solutions to the problem has been commendably in the spirit of scientific kinship. Their scientific literature is considerable, and the bird-strike problem so important that the Soviets have coined a new term: aviation ornithology. The necessary background - pure research has had to be not only into the role of sound in the daily and seasonal lives of the 'pest' species - mostly gulls, waders, crows and starlings - but also into their spring and autumn migration behaviour patterns (which may involve radar tracking of birds on the move) and into the feeding behaviour of both these birds of passage and of birds that nest in the vicinity of airports. It has to be born in mind from the start that the solution may prove not to be a bioacoustic one; or at least not only so. As things have turned out, however, the use of sound repellents is one important weapon in the armoury of he who would strive to keep runways clear of birds - at least at those times when aircraft are due to take off and land!

Work has been done on the potential bird-strike problem in the Crimea, Soviet Central Asia, the Soviet Far East, the Kalinin region and the Baltic states. V.S. Shevyakov and A.V. Tikhonov have described in some detail the successes achieved at airports in Lithuania. To start with, it is important to study the behaviour of the birds concerned, be they Rock (Town) Pigeons *Columba livia*, Lapwings *Vanellus vanellus* (shore birds), Starlings, members of the gull family like the Black-headed, Common and Herring

Gulls, or, lastly, members of the crow family like the Hooded Crow *Corvus corone cornix*, the Rook and the Jackdaw *C. monedula*. Some of these species (e.g. the pigeon) may be year-round residents. Others may occur mainly on northward spring migration and southward autumn migration, e.g. the Starling. Others may breed in the area, e.g. the Rook, Jackdaw, and why the birds use the airport is important to determine. All species will feed there; others will rest by day in the comparative safety of a wide open space where approaching predators like Goshawks *Accipiter gentilis* can be spotted in better time. Yet others choose to roost there by night. In late summer and autumn, following the breeding season, there are more birds and a higher percentage of inexperienced ones who behave differently from adults. Before trying to change something it is important to know *from* what behavioural base one is starting.

Prevention is better than cure. So in instances where, say, breeding colonies of Rooks alongside Kaunas airport or of Black-headed Gulls by Palanga airport; or winter assemblies of roosting crows are occupying stands of trees near Vilnius airport, they are dispersed by playing during the nest-building period or at the start of evening congregation a mixture of alarm and distress cries. An alarm cry is given by a bird when it spots a potential enemy and it acts as a warning; a distress cry is emitted by a bird that has been caught. It is an interesting, and in these cases, an exceedingly useful fact of nature, that alarm and distress cries - unlike birds' songs - are not specific to each species. No. Because a Jackdaw can make use of a Hooded Crow's alarm cry, and *vice versa*, natural selection has caused the form of the alarm call of each to converge. So, faced with a mixed-species flock on the runway, the Soviet scientist plays one species' warning but gets a simultaneous response from several species.

The 'prevention before cure' principle finds another expression, this time on the part of the man in the control tower looking out at an airfield dotted with loudspeakers. He can more easily deter birds by playing back to them *before* they have landed. Once they are on the ground it is more difficult to shift them. Indeed it can often prove necessary to follow on with supplementary acoustic effects: gunshots and thunder-flashes; the more so in autumn when inexperienced adolescent birds figure largely in the flocks of, say, gulls and starlings.

The Starling is the most common bird likely to be involved in a collision with an aircraft and moves about in sizeable flocks. It is the most common of all at migration time when populations bound for destinations both near to Lithuania and very far from there, move through.

To be continued in the next issue

THE COLLECTION AT LEEDS CASTLE (Maidstone, Kent)

By K. LAWRENCE
(Chelmsford, Essex)

On one of the finest Saturdays last summer, a party of members of our Society visited Leeds Castle, at the invitation of the Directors and David Frank, Curator of the new aviaries at this historic castle. The visit must have been nostalgic to those of our members who remembered the wonderful collection of parrots owned by the late Lady Baillie, who was the last owner of the castle.

The new aviaries, which were opened to the public in 1987, are most impressive being hexagonal in shape and constructed in the main from stainless steel which will ensure their durability for many years to come. All the aviaries were well stocked but not overcrowded, with a number of rare species being displayed under ideal conditions.

The collection ranged from representatives of the cockatoo family to the small waxbills and finches. Most of the collection was well labelled, which makes the exhibits so much more interesting to the visiting public, and often helpful to the aviculturist who may have difficulty in identifying rarer species.

The birds are supported by a nursery where young birds are weaned off, an incubation room and a finely appointed kitchen, where all the specialised foods are prepared under ideal conditions. These extra facilities are essential to a collection such as this where breeding is of prime importance.

The cockatoos were represented by the Red-vented, Palm and Leadbeater's, all in pairs, with the hopes of breeding successes in the future. The parrots on display included Lilac-crowned, Tucaman, Yellow-headed and Blue-fronted Amazons, a single Kea, for which a mate is hoped to be obtained, and Hawk-headed. Macaws such as Scarlet, Noble and Red-fronted were on view, and to complete the range, Red, Yellow-backed and Swainson Lorikeets.

The softbilled birds included Spreeo Starlings, which had already reared young before our visit, Red-billed Blue Pies which were nesting at the time, as well as Royal Starlings, Violaceous Turacos, Toco Toucans, Kookaburras and, although not really a softbill but a fruit eater, Yellow-breasted Fruit Doves.

Of the small seedeaters, the pair of Star or Ruficauda Finches attracted great attention from all members of the party, as they were nesting

so close to the netting that the hen could almost be touched but she sat tight on her clutch of eggs.

As far as possible, all the birds were housed in pairs or small groups, being carefully selected to ensure that there were no problems of bickering, etc. They were provided with plenty of the correct nesting facilities at the same time being displayed in such a way that the public could see the birds without causing any undue stress or disturbance to the aviary inmates.

Congratulations must go to the planners and management of these new aviaries for the layout, selection of birds and general appearance of the whole area where the birds are housed. I am sure that in the future the project will grow and I would recommend to all our members who have the opportunity to visit Leeds Castle to go and see the birds, the Castle itself and the wonderful grounds in which it is situated.

* * *

AVICULTURAL SOCIETY NEWS

The President's Garden Party was held on Sunday, 4th June, 1989, at Chestnut Lodge, Cobham, Surrey, by kind invitation of Miss Ruth Ezra and Mr. Raymond Sawyer. The weather was kind and members were given a conducted tour of this world-famous collection of birds, followed by tea in the gardens. A full account of this event will appear in the next issue of the *Avicultural Magazine*. Meanwhile, on behalf of everyone who was able to come (and once again, we regret that some members had to be disappointed) we would like to thank Miss Ezra and Mr. Sawyer for such an enjoyable and interesting afternoon, and for most generously donating the ticket money to the Society's funds (over £300 including donations was received).

Details of the autumn social meeting and of the Annual Dinner will be sent to members separately.

Hon. Secretary

* * *

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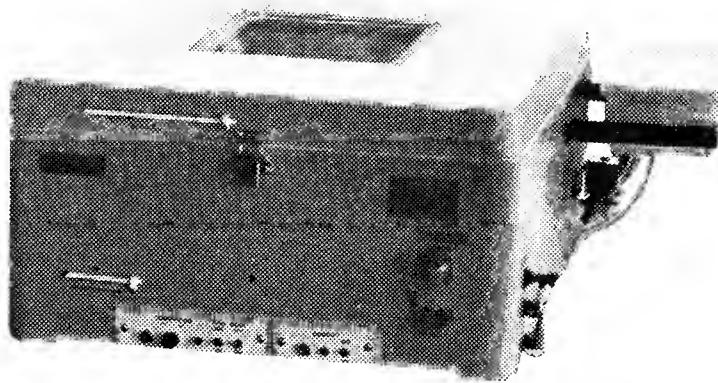
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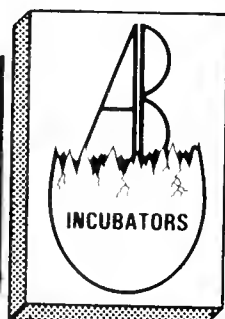


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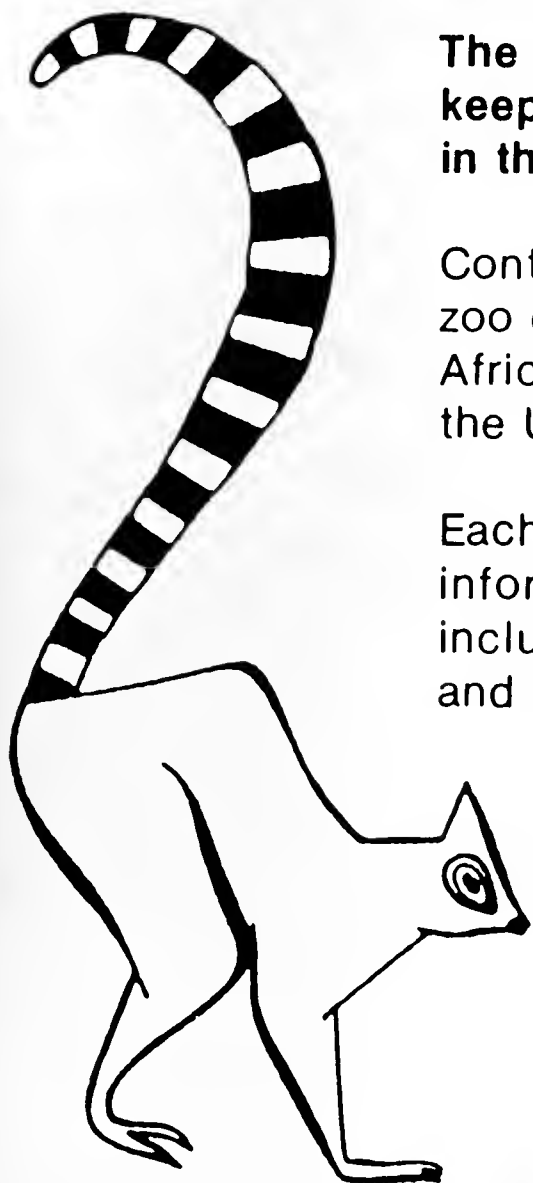
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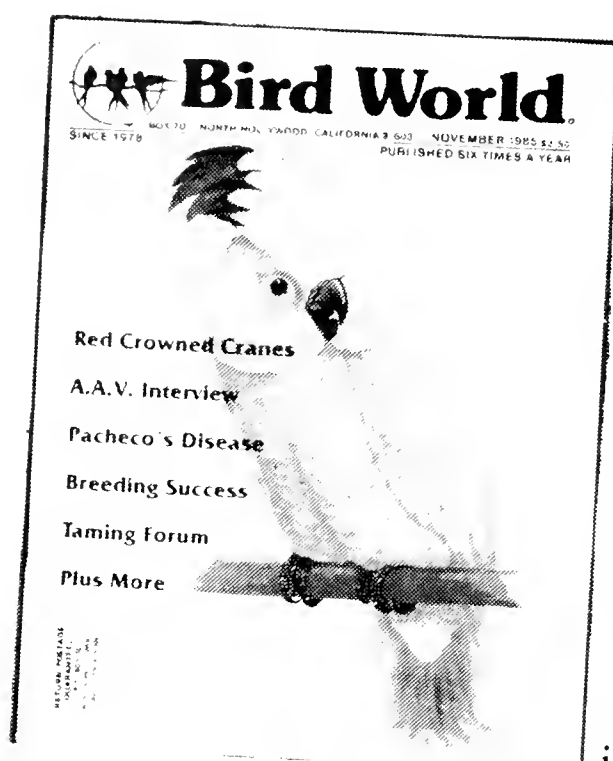
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BREEDING RECORD FOR THE ZOOLOGICAL SOCIETY OF SAN DIEGO, CALIFORNIA, IN 1988

By ALAN LIEBERMAN, WILLIAM TOONE AND
CYNTHIA KUEHLER

The Zoological Society of San Diego which manages the facilities of the San Diego Zoo and the San Diego Wild Animal Park, saw in 1988 breeding successes in 112 species of birds for a total of 698 chicks. Of this total production, 510 chicks survived 30 days for a 74% survivability rate. This is a remarkably good percentage considering the number of altricial species being reared, both parentally and artificially.

The following brief accounts are for those species which are considered notable. The 1988 breeding record is summarised in Table 1.

SAN DIEGO ZOO

A trio of Grey-winged Trumpeters (2.1) *Psophia crepitans*, produced a total of 35 chicks in a single year; 26 being hand-reared and nine being parent-reared. The breeding trio were housed out of doors and on exhibit in a planted aviary measuring approximately 12 x 40 x 13 ft high (3.66 x 12.18 x 3.96 m). The Trumpeters share the aviary with a variety of soft-billed species. Their diet consists of Nebraska Brand Bird-of-Prey food, moistened dog food, eggs, small seeds, chopped fruits, new-born mice and live food (mealworms and crickets). The diet for the chicks, both artificially and parentally reared, is the same as above. Eggs were incubated from day 1 at 99°F and 88°F wet bulb. Incubation is 28-29 days. The adults prove to be good parents and the chicks in all cases do not prove difficult. Eggs were laid in a small cave about 2m from the ground.

The Buff-crested Bustard *Lophotis ruficrista* registered a first breeding for the Society in 1988 and may be a first breeding for North America (Marvin Jones, pers. comm.). The trio (1.2) are exhibited outdoors in a planted aviary with similar dimensions to the trumpeter exhibit. They share the exhibit with various African softbills and a pair of Kirk's Dik-Dik. Eggs were laid on the ground in a shallow scrape. Artificial incubation is

19-21 days at 99°F and 88°F wet bulb, and the chicks were hand-reared without mishap on a diet of turkey grower, apple and greenstuff.

The pair of Blue Whistling Thrush *Myiophoneus c. caeruleus* bred in a walk-through aviary shared by over 20 species of softbills and pheasants. They built a mud and debris nest on a cross-member under a structure designed to shield the visitors from the elements. The three eggs pulled for hand-rearing hatched after 16 days, incubated at 100.5°F and 86°F wet bulb. The hand-reared chicks survived for 18, 17, and 12 days, being fed on a diet of cat food slurry (with papaya and apple sauce) later weaned to whole fruit chunks, crickets, newborn mice and mealworms. The second clutch was left for parental rearing. Parental diet was fruits *ad lib.*, moistened dog food, Ziegler Lo-Iron pellets, chopped egg and live food (crickets and mealworms).

A species new to San Diego and, according to Raethel (1988), never before exported from Saudi Arabia is the Philby's Rock Partridge *Alectoris philbyi*. A group of eight birds was imported from Taif, Saudi Arabia, in September 1987 and began laying in May 1988. The breeding pair laid off exhibit in a pheasant run measuring 8 x 20 x 8 ft high (2.44 x 6.10 x 2.44m). Diet was small seed, pheasant crumbs, greenstuff and apple. Artificial incubation lasted 24-26 days at 99.5°F and 84°F, and chicks were fed a diet of ground starter crumbs, weaned to turkey grower with mixed seeds, greenstuff and hard-boiled egg.

A second desert partridge, the Arabian Sand Partridge *Ammoperdix heyi intermedia*, also imported from Taif in the same shipment with the Philby's Partridge, laid in May 1988. Two breeding pairs laid both on and off exhibit. One pair is housed in a cage similar to that of the Philby's Partridge. The second pair is housed on exhibit, out of doors, in a planted aviary shared by African finches and bee-eaters. Adult and chick diet was as for the Philby's. This is probably a first breeding, if not first importation for this species of desert partridge (Raethel, 1988; Seth-Smith, 1911; Trevor-Battye, 1905).

SAN DIEGO WILD ANIMAL PARK

Californian Condor *Gymnogyps californianus*

The recovery efforts for the Californian Condor were given a fresh shot of optimism on 29th April 1988, when the first Californian Condor conceived in captivity, was successfully hatched. On 24th September 1987, courtship began and copulations were first seen in the third week of January, 1988. On 3rd March the egg was finally laid and immediately removed from the nest by the birds' keepers and artificially incubated in a

Petersime incubator. The parents of Molloko (a Northern Maidu Indian name for the condor), were both wild-caught individuals; the female (UN1) is a bird of unknown age while the male (AC-4) was eight years old.

Daurian Redstart *Phoenicurus aureus*

To the best of our knowledge, this delicate thrush has not been bred in American collections. On 29th May the female began collecting nest material. We suspected that eggs had been laid on or about 8th June and on the 25th both birds were seen taking mealworms to the nest. Though what happened is not known, two days later the birds began rebuilding the nest. On 26th and 30th July, one live chick and two dead chicks respectively were discovered. The single chick survived.

African Pygmy Falcon *Polihierax semitorquatus*

The African Pygmy Falcon, like most other falcons, does not build its own nest; on occasion it will evict occupants but usually takes over an abandoned nest. In the case of the pygmy falcon, the host nest-builder is the Buffalo Weaver. Although in Europe the pygmy falcon breeds well in a standard nest-box, we were able to offer an old Buffalo Weaver nest. The pair first laid a three-egg clutch; the eggs were fertile but died early in incubation. A second clutch of three eggs was laid and the eggs were taken for artificial incubation and one chick was successfully hand-reared. A third clutch of two eggs was replaced with dummy eggs while their eggs were artificially incubated. One chick was hatched, placed under the parents and successfully reared.

Great Indian Hornbill *Buceros bicornis*

Courtship behaviour and visits to the nest-box began in earnest in mid-February. The female spent most of her time in the box mudding up the doorway with the assistance of the male. One egg was laid some time between 27th March and 3rd April. A blind and helpless chick was hatched on 9th May. At two weeks old, the chick's eyes were still closed and there were no signs of feather tracts. On 26th June the female left the nest-box. The chick was fully feathered and about two-thirds the size of the female. By 22nd July the chick began venturing from the box.

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TABLE 1: SPECIES AND NUMBERS OF BIRDS HATCHED AT THE
ZOOLOGICAL SOCIETY OF SAN DIEGO
1st January 1988 - 31st December, 1988

(Figures in brackets represent chicks which did not survive for 30 days)

SPECIES	ARTIFICIAL HATCH	PARENT HATCH	TOTAL
Mantell's Brown Kiwi <i>Apteryx australis mantelli</i>	0.1.0.	0.0.0.	0.1.0
Little Blue Heron <i>Egretta caerulea</i>	0.0.0.	0.1.1	0.1.1
Hammerkop <i>Scopus umbretta</i>	0.0.0	4.5.1 (0.1.0)	4.5.1 (0.1.0)
Hadada Ibis <i>Hagedashia hagedash nilotica</i>	0.0.0	1.2.5 (0.1.2)	1.2.5 (0.1.2)
Crested Screamer <i>Chauna torquata</i>	1.2.0 (1.0.0)	0.0.0	1.2.0 (1.0.0)
Red-billed Whistling Duck <i>Dendrocygna a. autumnalis</i>	14.4.0 (1.0.0)	0.0.0	14.4.0 (1.0.0)
Cape Teal <i>Anas capensis</i>	11.6.0	0.0.0	11.6.0
Hottentot Teal <i>A. punctata</i>	9.9.2 (0.0.2)	0.0.0	9.9.2 (0.0.2)
Cape Shoveler <i>A. smithi</i>	3.6.3 (0.1.1)	0.0.0	3.6.3 (0.1.1)
S. African Black Duck <i>A. sparsa</i>	3.4.0	0.0.0	3.4.0
Bronze-winged Duck <i>A. specularis</i>	1.0.0	0.0.0	1.0.0
Ringed Teal <i>Callonetta leucophrys</i>	11.14.3 (1.1.3)	6.2.0 (2.1.0)	17.16.3 (3.2.3)
N. American Ruddy Duck <i>Oxyura j. jamaicensis</i>	4.3.0	0.0.0	4.3.0
Old World Comb Duck <i>Sarkidiornis m. melanotos</i>	5.8.1 (2.1.1)	0.0.0	5.8.1 (2.1.1)
Californian Condor <i>Gymnogyps californianus</i>	0.1.0	0.0.0	0.1.0
Andean Condor <i>Vultur gryphus</i>	0.2.0	1.0.0	1.2.0
African Pygmy Falcon <i>Polihierax semitorquatus</i>	0.2.1 (0.0.1)	0.0.0	0.2.1 (0.0.1)
Ocellated Turkey <i>Agriocharis ocellata</i>	0.0.3	0.0.0	0.0.3
Philby's Rock Partridge <i>Alectoris philbyi</i>	4.2.0	0.0.0	4.2.0
Arabian Sand Partridge <i>Ammoperdix heyi intermedia</i>	15.28.9 (2.1.8)	0.0.0	15.28.9 (2.1.8)
Chinese Bamboo Partridge <i>Bambusicola t. thoracica</i>	4.8.5 (2.2.2)	0.0.0	4.8.5 (2.2.2)

Golden Pheasant	1.0.0	0.0.0	1.0.0
<i>Chrysolophus pictus</i>			
Malayan Peacock Pheasant	2.3.8 (1.2.0)	1.2.1 (1.1.1)	3.5.9 (2.3.1)
<i>Polyplectron emphanum</i>			
Elliot's Pheasant	10.4.1 (3.0.1)	0.0.0	10.4.1 (3.0.1)
<i>Syrmaticus ellioti</i>			
Temminck's Tragopan	7.7.1 (0.0.1)	0.0.0	7.7.1 (0.0.1)
<i>Tragopan temminckii</i>			
Black-breasted Quail	2.0.3 (2.0.3)	3.0.3 (1.0.3)	5.0.6 (3.0.6)
<i>Turnix melanogaster</i>			
Stanley Crane	1.2.0 (1.0.0)	0.0.0	1.2.0 (1.0.0)
<i>Anthropoides paradisea</i>			
Red-crowned Crane	2.3.1	0.0.0	2.3.1
<i>Grus japonensis</i>			
Grey-winged Trumpeter	8.10.8 (1.2.1)	3.3.3 (1.1.1)	11.13.11 (2.3.2)
<i>Psophia crepitans</i>			
Grey-necked Wood Rail	1.0.6 (1.0.0)	0.0.0	1.0.6 (1.0.0)
<i>Eulabeornis cajaneus</i>			
Guam Rail	0.2.0	0.0.0	0.2.0
<i>Rallus owstoni</i>			
San Bittern	1.0.0	1.1.0 (1.1.0)	2.1.0 (1.1.0)
<i>Eurypyga helias</i>			
Crested Seriema	1.2.0	0.0.0	1.2.0
<i>Cariama cristata</i>			
Buff-crested Bustard	2.3.0	0.0.0	2.3.0
<i>Lophotis ruficrista</i>			
Cream-coloured Courser	3.0.0 (3.0.0)	0.0.0	3.0.0 (3.0.0)
<i>Cursorius c. cursor</i>			
Nicobar Pigeon	0.0.0	2.4.0	2.4.0
<i>Caloenas n. nicobarica</i>			
Green-winged Dove	1.4.1 (0.2.0)	1.1.0	2.5.1 (0.2.0)
<i>Chalcophaps indica</i>			
Speckled Pigeon	2.1.1 (1.0.1)	0.0.0	2.1.1 (1.0.1)
<i>Columba guinea</i>			
Diamond Dove	0.0.0	1.2.0	1.2.0
<i>Geopelia c. cuneata</i>			
Bank Pigeon	0.0.0	0.0.1	0.0.1
<i>Columba mayeri</i>			
Black-naped Fruit Dove	0.0.0	1.0.0	1.0.0
<i>Ptilinopus melanospila</i>			
Superb Fruit Dove	0.0.0	2.0.1 (1.0.1)	2.0.1 (1.0.1)
<i>P. superbus</i>			
Green-naped Pheasant Pigeon	2.2.1 (2.2.0)	2.1.1 (0.1.1)	4.3.2 (2.3.1)
<i>Otidiphaps n. nobilis</i>			
Galapagos Dove	0.0.0	1.2.6 (0.0.4)	1.2.6 (0.0.4)
<i>Zenaida galapagoensis</i>			
Duivenbode's Lory	1.2.0	3.3.1 (0.0.1)	4.5.1 (0.0.1)
<i>Chalcopsitta d. duivenbodei</i>			
Black Lory	1.1.0	0.1.0	1.2.0
<i>Chalcopsitta a. atra</i>			

Stella's Lory <i>Charmosyna papou stellae</i>	3.3.0 (1.1.0)	1.0.0 (1.0.0)	4.3.0 (2.1.0)
Dusky Lory <i>Pseudeos fuscata</i>	0.0.0.	1.1.2 (1.1.0)	1.1.2 (1.1.0)
Goldie's Lorikeet <i>Trichoglossus goldiei</i>	0.0.0	1.0.4 (1.0.0)	1.0.4 (1.0.0)
Forsten's Lorikeet <i>T. haematodus forsteni</i>	0.1.3 (0.1.0)	0.0.0	0.1.3 (0.1.0)
W. Iris Lorikeet <i>T. i. iris</i>	0.0.1	1.1.0	1.1.1
Tahitian Lory <i>Vini peruviana</i>	0.0.3 (0.0.2)	0.0.0	0.0.3 (0.0.2)
Leadbeater's Cockatoo <i>Cacatua leadbeateri</i>	0.0.2	0.0.0	0.0.2
Rose-breasted Cockatoo <i>Eolophus roseicapillus</i>	0.0.4	2.0.1 (2.0.0)	2.0.5 (2.0.0)
Sulphur-crested Cockatoo <i>Cacatua g. galerita</i>	0.1.1	0.0.0	0.1.1
Citron-crested Cockatoo <i>C. sulphurea citrinocristata</i>	0.0.0	0.0.1	0.0.1
Slender-billed Cockatoo <i>C. t. tenuirostris</i>	0.0.2	0.0.0	0.0.2
W. Red-tailed Black Cockatoo <i>Calyptorhynchus magnificus naso</i>	0.0.3	0.0.1	0.0.4
Australian King Parrot <i>Alisterus s. scapularis</i>	0.0.3 (0.0.1)	0.0.0	0.0.3 (0.0.1)
Yellow-headed Amazon <i>Amazona ochrocephala oratrix</i>	0.0.4	0.1.0 (0.1.0)	0.1.4 (0.1.0)
Green-winged Macaw <i>Ara chloroptera</i>	0.0.0	0.0.1 (0.0.1)	0.0.1 (0.0.1)
Golden Conure <i>Aratinga guarouba</i>	2.2.4	0.0.0	2.2.4
Grand Eclectus <i>Eclectus roratus</i>	0.0.0	0.0.2	0.0.2
Blue-crowned Hanging Parrot <i>Loriculus galgulus</i>	0.0.0	0.1.4	0.1.4
Blue-winged Parrakeet <i>Neophema chrysostoma</i>	0.0.0	1.0.1	1.0.1
Scarlet-chested Parrakeet <i>N. splendida</i>	0.0.0	3.0.2 (1.0.0)	3.0.2 (1.0.0)
Pale-headed Rosella <i>Platycercus a. adscitus</i>	0.0.0.	0.0.3	0.0.3
Rock Peplar <i>Polytelis anthopeplus</i>	0.0.0	0.0.4 (0.0.3)	0.0.4 (0.0.3)
Derbyan Parrakeet <i>Psittacula derbiana</i>	0.0.0	1.0.4 (0.0.3)	1.0.4 (0.0.3)
Desmarest's Fig Parrot <i>Psittaculirostris d. desmarestii</i>	1.0.1 (1.0.1)	1.1.0 (1.1.0)	2.1.1 (2.1.1)
Timneh Grey Parrot <i>Psittacus erithacus timneh</i>	0.0.0	1.0.1	1.0.1

Red-capped Parrot <i>Purpureicephalus spurius</i>	0.0.0	0.3.1 (0.3.1)	0.3.1 (0.3.1)
Thick-billed Parrot <i>Rhynchopsitta p. pachyrhyncha</i>	0.0.0	0.0.1	0.0.1
Grey Go-Away Bird <i>Corythaixoides c. concolor</i>	2.3.1 (1.0.1)	1.3.0 (1.2.0)	3.6.1 (2.2.1)
Lady Ross's Touraco <i>Musophaga rossae</i>	0.0.4 (0.0.2)	0.0.0	0.0.4 (0.0.2)
Schalow's Touraco <i>Tauraco corythaix schalowi</i>	0.0.0	1.0.0	1.0.0
Renauld's Ground Cuckoo <i>Carpococcyx renauldi</i>	1.7.4 (1.7.4)	0.0.0	1.7.4 (1.7.4)
Thailand Bay Owl <i>Phodilus b. badius</i>	0.0.0	0.0.2	0.0.2
Spectacled Owl <i>Pulsatrix perspicillata</i>	2.0.1	0.0.0	2.0.1
S. Kookaburra <i>Dacelo n. novaeguineae</i>	0.0.2	0.0.0	0.0.2
White-collared Kingfisher <i>Halcyon chloris</i>	0.0.0	0.0.3	0.0.3
Abyssinian Ground Hornbill <i>Bucorvus abyssinicus</i>	4.2.2 (1.1.0)	0.0.0	4.2.2 (1.1.0)
Leadbeater's Ground Hornbill <i>B. leadbeateri</i>	0.0.1	0.0.0	0.0.1
Great Indian Hornbill <i>Buceros bicornis</i>	0.0.0	0.0.1	0.0.1
Tarctic Hornbill <i>Penelopides panini manilloe</i>	0.0.0	2.1.1	2.1.1
Crested Barbet <i>Trachyphonus v. vaillantii</i>	0.0.4 (0.0.1)	3.2.8	3.2.12 (0.0.1)
Bolivian Cock-of-the-Rock <i>Rupicola peruviana saturata</i>	1.0.0	0.0.0	1.0.0
Common Shama Thrush <i>Copsychus malabaricus</i>	0.0.0	2.2.3 (1.2.0)	2.2.3 (1.2.0)
Blue Whistling Thrush <i>Myiophoneus c. caeruleus</i>	1.2.0 (1.2.0)	1.2.0	2.4.0 (1.2.0)
Groundscraper Thrush <i>Turdus litsipsirupa</i>	0.1.3 (0.1.3)	0.0.4 (0.0.4)	0.1.7 (0.1.7)
Daurian Redstart <i>Phoenicurus aureus</i>	0.0.0	2.0.3 (0.0.3)	2.0.3 (0.0.3)
White-necked Laughing Thrush <i>Garrulax strepitans</i>	2.1.4 (2.1.2)	0.0.1	2.1.5 (2.1.2)
Red-tailed Laughing Thrush <i>G. milnei</i>	0.0.1	1.2.2 (0.0.2)	1.2.3 (0.0.2)
White-browed Laughing Thrush <i>G. sannio</i>	0.0.0	0.0.2	0.0.2
Silver-eared Mesia <i>Leiothrix argentea</i>	0.0.0	1.0.3 (2.0.3)	1.0.3 (2.0.3)
Painted Bunting <i>Passerina ciris</i>	0.0.0	0.0.1	0.0.1

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Orange-breasted Wax bill <i>Amandava subflava</i>	0.0.0	0.0.1	0.0.1
Black-bellied Fire Finch <i>Lagonosticta rara</i>	0.0.0	0.0.6	0.0.6
Owl Finch <i>Poephila bichenovii</i>	0.0.0	0.0.3	0.0.3
Orange-winged Pytilia <i>Pytilia afra</i>	0.0.0	0.0.1	0.0.1
Blue-capped Cordon Bleu <i>Uraeginthus cyanocephala</i>	0.0.0	0.0.10	0.0.10
Gouldian Finch <i>Chloebia gouldiae</i>	0.0.0	0.1.2	0.1.2
Star Finch <i>Neochmia ruficauda</i>	0.0.0	0.0.1	0.0.1
White-headed Buffalo Weaver <i>Dinemellia dinemellia</i>	0.0.0	0.0.1 (0.0.1)	0.0.1 (0.0.1)
Bay-headed Tanager <i>Tangara gyrola</i>	0.0.0	1.1.0 (1.0.0)	1.1.0 (1.0.0)
Emerald Starling <i>Lamprotornis iris</i>	0.0.0	0.0.2	0.0.2
Superb Starling <i>Spreo superbus</i>	0.0.0	0.0.3 (0.0.1)	0.0.3 (0.0.1)
Bali Mynah <i>Leucopsar rothschildi</i>	0.0.0	0.2.5 (0.0.2)	0.2.5 (0.0.2)
Coletto Mynah <i>Sarcops calvus</i>	0.0.0	0.1.1 (0.0.1)	0.1.1 (0.0.1)
Plush-crested Jay <i>Cyanocorax chrysops</i>	0.0.0	0.0.3 (0.0.3)	0.0.3 (0.0.3)
Asiatic Azure-winged Magpie <i>Cyanopica cyana swinhoi</i>	1.1.0 (1.1.0)	1.0.10 (1.0.7)	2.1.10 (2.1.7)
Superb Bird-of-Paradise <i>Lophorina superba feminina</i>	0.0.0	0.0.1 (0.0.1)	0.0.1 (0.0.1)

* * *

BREEDING THE "NEGLECTED PARROTS": THE *TANYGNATHUS*

By ROSEMARY LOW

(Gran Canaria, Spain)

Tanygnathus actually means 'extended jaw' - referring to the bill - but to me it means the neglected parrots. Few genera available in aviculture (albeit sporadically) have been so neglected by aviculturists and few are so poorly represented in the literature. A.G. Butler, writing 80 years ago, gave more information than can be found in most modern parrot books.

Five species are recognised but only three are known in aviculture and few breeding successes have been recorded. It is worth noting that in 1988 not only did three species produce chicks at Loro Parque, Tenerife, but that in two cases the hatchings occurred within four months of the pairs being put together.

Tanygnathus have affinities with the genera *Psittacula* and *Eclectus*; indeed, in German they are given the same name as *Eclectus*: Edelpapagei. They are medium-sized parrots, i.e. about 12in (31cm) in length, except the Great-bill which is about 15in (39cm) long. They are basically green but two species have intricate and extremely beautiful wing markings. Their tails are short and not as wide as those of *Eclectus*.

They originate from Indonesia, the Western Papuan Islands, the Moluccas and the Philippines. Very little is known about their behaviour in the wild. It is of interest that two species, Muller's and the Black-lored, have been described as nocturnal on occasions, even on moonless nights.

The Great-billed *T. megalorhynchus* (often written *megalorynchos* after Forshaw, 1973, or *megalorynchus*) is found in Indonesia (Lesser Sunda Islands, Western Papua, Moluccas, Celebes), also Balut in the Philippines. The preferred habitat is coastal and small islands. Plumage is alike in male and female but the male's bill is noticeably larger.

The Blue-naped Parrot *T. lucionensis* is from the Philippines (Luzon, Mindoro, Polillo, Palawan and the Sulu Archipelago), islands off north-eastern Borneo and Talaud Island. It inhabits forest and open country. The male usually has brighter and more clearly defined wing markings than the female.

Muller's Parrot *T. sumatranus* or *muelleri* comes from the Philippines including the Sulu Archipelago, Talaud and Sanghir and Celebes. At least in Celebes, it is found along forest edges, rarely in the interior. In this species the bill is red in the male and whitish in the female.

The Black-lored *T. gramineus* is from Buru Island, Indonesia. Very

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little is known about it but it has been observed in the mountains, above 700m. The bill is red in the male and whitish in the female.

The Rufous-tailed Parrot *T. heterurus* is a mysterious bird, supposedly an aberrant specimen of Muller's Parrot and known to scientists only from the type specimen, thought to be from Celebes. I have, however, seen photographs of several *Tanygnathus* with the underside of the tail rufous in a holding cage in Indonesia and perhaps three or four years ago heard that similar birds had been imported into the USA - but no further references have been made to them. Also, there are references to this species in *An Investigation of Parrots and their Trade on Pulau Bacan (North Moluccas) and Pulau Warmar, Aru Islands* by G. Randy Milton and Agus Marhadi, a report published by WWF/IUCN in 1987. Table 17 lists the estimated retail value of parrots imported from Indonesia into the USA in 1984, and includes 13 *T. heterurus* with an estimated retail value of 400 dollars each. Appendix V gives records of species exported from Indonesia from 1981 to 1984 and includes 85 *heterurus* in 1981 and 205 in 1983. Someone, somewhere, must know something about these birds!

The slight increase in the appearance of *Tanygnathus* in trade this decade can be directly linked to deforestation and logging activities, since areas recently opened up by logging are usually favoured by parrot trappers in Indonesia. In 1984 and 1985, for example, the quotas for the "legal harvest" of the Great-billed Parrot from Indonesia were 5,750 each year yet none was recorded as being exported from Indonesia in 1984 by the relevant authorities.

I suspect that losses with newly captured and recently imported Great-billed Parrots are quite high and this may deter importers from bringing in these birds, together with the fact that many parrot breeders have never seen *Tanygnathus* species and therefore have no interest in them. Dealers often can sell the rarer parrots only to visitors to their premises - and not by advertising them - simply because breeders have so little curiosity about species with which they are not familiar. The *Tanygnathus* tend to be quiet, rather inactive aviary birds, yet there is something appealing about them that grows on one. They are capable of harsh sounds yet more often utter quiet conversational sounds. If they are shy, it is difficult to get to know them; in the 9m long aviaries in which they are exhibited at Loro Parque, all except the male Great-bill fly away from the public.

On exhibit in a different area of the park at the time of writing are the three 1988-hatched, parent-reared *Tanygnathus*, one 1987 *lucionensis* bred in Germany and a surplus Muller's. The 1987 *lucionensis* is an extremely beautiful, tame and inquisitive bird and his influence is taming down the 1988 young bird, which remained nervous while with his parents. In fact, this aviary is situated with its length along the path where an

average of 2,000 people pass daily. In similar situations all the birds in the park are tame. Those near the dolphinarium, where the remainder of the *Tanygnathus* are housed, can fly the full length of the aviary away from the public, thus they alone are not tame.

Undoubtedly my favourite individual is the male Great-bill. Soon after I became curator in February 1987, I wrote to Blackpool Zoo in the UK to try to obtain this bird on breeding loan. At that time the species was represented at Loro Parque by a single female who had laid eggs when on her own. I was delighted when Blackpool Zoo generously sent us this bird on loan on 20th December 1987, and I was enchanted by his tameness.

In January, at the end of the quarantine period (within the park) he was introduced to the female. By 9th February she was incubating two eggs. These were infertile, no doubt due to the haste with which they were laid! They were removed before the end of the incubation period and by 18th March the female was incubating two eggs in the second clutch, which was to number three eggs. One of these was removed to the incubator where a chick hatched on 14th April. Another chick hatched in the nest on 15th April and when it was established that it was being fed, the first chick was placed in the nest. I was more excited about the hatching of these chicks than any others at Loro Parque in 1988 - but alas, my satisfaction was short-lived. One chick was found dead in the nest on 22nd April; it had enteritis, pericarditis and swollen spleen and liver. The other was removed for hand-rearing but was not thriving. It died on 29th April, apparently from an infection of the heart.

Within a month the female had laid again; she had one egg by 17th May which was infertile. She did not lay again until 26th November, probably stimulated by the few rainy days during the preceding three weeks. The period between May and October was virtually rainless. Unfortunately, the two eggs in the November clutch failed to hatch.

The only successful breeder of this species, to my knowledge, is Herr Leidner in Germany. He first bred it in 1984. The breeding pair proved infertile between 1985 and 1987. At the end of 1987 four birds, including the breeding pair, were housed together in an indoor aviary measuring 7ft 6in (2.5m) square, while the old aviaries were being rebuilt. The female of the breeding pair laid two eggs at the end of February. Two chicks had hatched by 25th March. They were removed for handrearing at the age of 20 days, but no details of this were given (Leidner, 1988). The female laid again 25 days later.

A little more is known about the Blue-naped Parrot than the other members of the genus. It was the first to be bred in captivity, in the USA in 1937. Little more was recorded about it until the late 1970s when a few birds were imported into Europe and the USA. Penny Luczak of

West Virginia was, in 1979, the next American breeder. In Germany there have been several successes (Leidner, 1984; Krohn, 1984) and in the UK in 1983, as the result of the combined efforts of George Smith and Kenneth McKenzie, and by David Alderton. In France, this species has been reared by Marc Boussekey and at Loro Parque, Tenerife, one was hatched in 1988. It was reared by the parents who are rather nervous and nest inspection revealed little when the chick was small as the female would not move off the nest. (This was a nest-box measuring 12in [31cm] square and 30in [77cm] high.) I was unable, therefore, to collect as much information as I would have liked. Smith (1984) described the display and copulation.

The following can be gained from these few breedings. In at least one instance the female did not commence incubation until the second of the two eggs was laid. Then both chicks hatched within two hours of each other and after 25 days (Krohn, 1984). George Smith (1984) found the incubation period to be 26 days and Mrs. Bonestell (1937) reported that it was 28 days. The Loro Parque chick hatched after 25 days.

Eggs are laid every other day, or every third day, and the clutch size is two or three. It seems that they are like *Eclectus* in that some males will enter the nest and feed the young from soon after they hatch. In one case it was recorded that the male spent more time in the nest than the female. The Loro Parque male spent a lot of time in the nest.

Newly hatched chicks have very thin, sparse down. They weigh 10g. At three weeks they are covered in the second down which is greyish-white or dark grey. The eyes open at between 12 and 18 days. The chicks reared by Krohn were ringed at 13 days with a 7.5mm ring. The one reared at Loro Parque was ringed at 13 days with a 9.5mm ring. I would suggest that 8.5mm is the best size.

Krohn recorded the weights of his two young (hatched on the same day) as follows: 10 days, 42g and 57g; three weeks, 140g and 125g; six weeks, 215g and 200g. The eldest left the nest at 54 days weighing 225g and the second chick at 63 days (210g). The 15g difference in weight was maintained and Krohn believed that the eldest, which had a larger beak and head, was the male.

If the *lucionensis* bred by Leidner did hatch after 23 days then it spent 63 days in the nest. The two reared by George Smith's female left the nest at 56 days. The one reared at Loro Parque was first seen out of the nest at 73 days although it might have left before as it spent several days looking out and was very shy. It then had nearly as much blue on the crown and nape as the adults (they are of the nominate race) but the shade was duller. There was no blue on the wing coverts which were green margined with yellowish green.

The first recorded breeding of Muller's Parrot occurred in 1984 in Florida. M.D. Moll and K.K. Muser put a male (estimated to be six years old) and a female together in May 1983. They started working in the nest-box in early September. The box measured 12in (31cm) square and 2ft (61cm) high. Two eggs were laid in early November at intervals of two days, but these proved to be infertile. The two eggs of the next clutch were laid on 27th and 29th January. It was stated that female *and* male took part in incubation. A chick hatched on 21st February; two days later the other egg was checked and the chick found to be dead-in-shell. Assuming that it was the first egg that hatched, the incubation period was 25 days.

The chick was removed for hand-rearing at the age of eight days because its crop was empty when checked on two occasions that day. For the first two weeks the food consisted of soaked and blended monkey chow, peanut butter, carrot, banana, endive and a vitamin additive. After two weeks dry oatmeal baby cereal was added to the food to thicken it. The chick was weaned at 11 weeks old.

The pair that bred at Loro Parque in 1988 had been together for several years. Courtship feeding had been observed. They were then housed in the previously mentioned aviary with its length along the path, i.e. in close proximity to the public. On 11th January 1988 they were moved to one of the new 27ft (9m) long aviaries in the dolphinarium area. The female laid the first of three eggs on 31st May. The male has always been unable to fly, the feathering of his wings and tail being extremely poor. This did not stop him fertilising eggs, however. The first chick hatched on 25th June; the nest was inspected almost every day so the incubation period could have been 25 or 26 days. By 1st July there were two chicks.

Nest inspection gave little or no information. When the chicks were small the female refused to leave the nest. When they were old enough to leave unbrooded during the day, she would rush back to the nest as soon as anyone touched the aviary door. There was a danger that the male, who is very timid and tailless, would fall on to the concrete floor and injure himself as he became very concerned when the aviary was entered. It was impossible to inspect the nest from outside the aviary so nest inspection was carried out only once a week.

The main difference between the chicks of *lucionensis* and *sumatranus* is the beak colour. In *lucionensis* this becomes red well before the chick feathers. The two *sumatranus* bred at Loro Parque had the bill pale horn coloured with the upper central part of the upper mandible greyish on leaving the nest. The grey colour gradually disappeared until, by November, the beak was clear horn coloured in one young bird.

The first chick had left the nest, apparently prematurely, on 28th

August when it was sitting on the aviary floor unable to find its way back - despite the wire ladder from floor to perch which is kept in the aviary for the male's benefit. The young Muller's was replaced in the nest and did not make another exit until 6th September. I first saw the second chick out of the nest about seven days later. Prior to that, it had spent most of the day for several days leaning out of the nest entrance.

The immature birds differed from the adults only in the beak colour and eye colour, the latter being greyish. In adults the iris is white; by 1st December one of the young birds had a whitish iris, while the other still had the iris greyish. Their plumage was perfect when they left the nest, whereas the *lucionensis* had been plucked on the back and wings but feathered up quickly after fledging.

The three young *Tanygnathus* were removed from their parents during the second week in October and, as already mentioned, soon became tamer in company with an adult bird of each species. I would often pause in front of the aviary to admire the exquisite beauty of the wing markings of the 1987 *lucionensis* and the much more subtle beauty of the young *sumatranus*. Apart from the soft blue rump, the body feathers are entirely green, of several different shades - and yet the plumage is extraordinarily pleasing. The dark eyes of the young birds give them a doe-eyed, gentle appearance which is lacking in the adults. Parrots with a striking white iris can never look gentle!

In fact, they are very gentle birds and from the limited information available it seems that in some cases more than one pair can be kept together without problems. For example, Leidner's 1988 breeding of the Great-bill occurred in an aviary measuring 2.5m square in which two pairs were housed.

Tanygnathus appear to be like *Eclectus* in that they accept a wide variety of food items. At Loro Parque they are fed on a mixture consisting of soaked and sprouting sunflower, sprouting gorbanzas (chick peas), boiled peanuts, peanuts in the shell (their favourite), chopped apple, orange, cactus fruits (in season), peas, carrot and Swiss chard. Other foods are given in season, such as the small orange fruits of a species of palm which grows well in the park.

Tanygnathus can also be offered a mixture of small seeds such as canary, millet, oats, buckwheat and a little hemp, spray millet, other fruits such as grapes and pomegranates, berries of hawthorn and elder, cherries, walnuts, hazel nuts and pine nuts.

When rearing young, our birds are offered fresh corn on the cob and bread and milk with a calcium additive. Krohn offered a rearing food consisting of grated carrot, milk powder, the yolk of hard-boiled egg,

calcium and vitamins.

The nest boxes at Loro Parque measure approximately 12in (31cm) square and 2ft (61cm) high for *lucionensis* and *sumatranus* and 30in (76cm) high for *megalorhynchus*. Wood shavings are used in the bottom.

Egg measurements are as follows: *T. lucionensis* - 34 x 28mm, 32.5 x 27.5mm, 34 x 28mm, 33 x 27mm, 37 x 28mm (Loro Parque) and 33 x 28mm (two, Krohn). Weight of a fresh egg was 12.5g (Krohn). Two *megalorhynchus* (Loro Parque) measured 29 x 45mm and 29 x 43mm. I was unable to obtain any measurements for the *sumatranus* eggs at Loro Parque as there were only two and both hatched.

Perhaps these notes will encourage other aviculturists to record their experiences with this very interesting genus of parrots which is so little known and under-rated. Much remains to be learned about them.

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BREEDING AND HAND-REARING THE HOODED PITTA

Pitta sordida

AT THE DENVER ZOO (Colorado, USA)

By GENEVIEVE LEE, SUSAN HAEFFNER, JAMES ZAJICEK

Introduction

This paper describes the experiences and success of the Denver Zoo bird staff with the captive breeding of the Hooded Pitta. Although this species has been bred in captivity before (Olney, 1984; Olney, 1987), we were unable to find specific information on the breeding or hand-rearing. References were found for the captive breeding of two other Pitta species, Van den Bosch's Pitta *P. guajana irena* (Vernon, 1974) and the Giant Pitta *P. caerulea* (McKelvey and Miller, 1979).

Description

The Hooded Pitta is a brilliantly coloured ground bird of the Asian tropical forests. The crown of the head is a rich chestnut brown, the face and neck are jet black, and the eye is a deep brown. The back is leaf-green washed with blue, the rump is an iridescent sky-blue, and the tail (which is very short) is black and white. The wings are leaf-green with an iridescent sky-blue patch on the shoulder. The primaries are mainly black but there is a large white patch in the centre of the wing which is invisible when the wing is folded but very striking during flight. A colour photograph of a wild bird (Perrins and Middleton, 1985) shows the belly a brilliant scarlet but all our captive birds have belly feathers ranging from rose-pink to a pale buff-pink, separated from the aquamarine breast by a black band. The sexes are identical. There is no eclipse plumage.

Our Hooded Pittas have a calm and fearless temperament, which is especially pronounced during the breeding season. Two which are housed in a small, glass-fronted display habitually sit on the window ledge, inches from the public. Our breeding pair, which is housed in a large, walk-through aviary, become so bold during the breeding season that they frequently fly at shoulder height through the crowd and have been known to stand or even sunbathe on the public walk at the busiest time of the year.

In the non-breeding season, our Hooded Pittas are solitary birds who avoid conspecifics as much as possible and may be dangerously aggressive to each other if housed together in too small an enclosure. As the breeding season starts, the birds begin to chase each other. They can frequently be seen displaying in turns, the display consisting of stretching slowly up to the most extreme height and then suddenly lapsing back to a normal pos-

ture, while rapidly bobbing the tail up and down and giving an odd, growling vocalisation. (This growling vocalisation is also heard during the non-breeding season.) One bird will sometimes stand in front of the other and flick open the wings, displaying the bright white wing patch. Also limited to the breeding season is a distinctive advertising call of two clear, sharply falling, emphatic, whistled notes. Both sexes give the same displays and calls.

History

1986-1987. Our first pair of Hooded Pittas arrived in October, 1986. After a three-week quarantine, they were released into a large, walk-through aviary in the Denver Zoo's "Bird World". This aviary measured about 22m (70ft) long, 7.5m (25ft) wide, and 7.5m (25ft) high. The ceiling was composed almost entirely of banks of skylights. During the 1987 breeding season, 85-90% of these skylights were covered with translucent plastic panels. Most of these panels were removed during the winter of 1987-1988, so that during the 1988 breeding season 90% of the skylights were clear glass and the natural daylight in the exhibit was much brighter. The exhibit had no artificial lighting.

Water was supplied by a waterfall 1.5m (4ft) high, consisting of a series of descending, shallow pools which fed a concrete stream 1-2cm ($\frac{1}{2}$ -1in) deep and 3m (10ft) long. The stream ended in a pool about 2m (6ft) across and 60cm (2ft) deep. The floor was composed of natural soil. During the 1987 breeding season, live and artificial plants provided a dense and extensive canopy, sparse understory, and moderately sparse groundcover. During the 1988 breeding season, only live plants were present and provided a less extensive and less dense canopy, moderate understory, and thick, extensive groundcover.

At the time the Hooded Pittas were introduced, this spacious room housed 14 different species of birds, ranging from the Crested Wood Partridge *Rollulus roulroul* to the Sparkling Violet-Ear Hummingbird *Colibri coruscans*. The species composition and total numbers of birds in the exhibit have varied during the Pittas' tenure. In general, the Pittas seem to take no notice of other birds, the only exceptions being interactions with two other ground species, Crested Wood Partridges and White-fronted Crakes *Laterallus leucopyrrhus* when these were nesting at the same time as the Pittas.

During their first six months in the exhibit, both Pittas apparently remained solitary in their habits. While they were observed, they were seen at opposite ends of the display.

In May 1987, the first breeding behaviour was observed. On 25th May the female began displaying. She stood in front of the male, spreading her

wings. After this, the Pittas were seen together much of the day.

The next day both birds were observed performing the tall-stretch display described earlier. On 27th May the male was observed crouching on the ground vocalising, with the female standing nearby. The vocalisation sounded like the growling of a small, hoarse dog. The next day the male was in the same area and again vocalising. On 1st June this area was found littered with twigs and leaves.

On 4th June the male Pitta was seen attempting to arrange twigs and leaves on the nest site, but with little success. On the same day, it was noted that a pair of Crested Wood Partridges had started to build a nest in a raised planter pocket situated in a corner at the opposite end of the exhibit from the Pitta activity. The completed nests of Hooded Pittas and Crested Wood Partridges are superficially similar in size and shape, being enclosed domes on the ground about the size of a large honeydew melon with a round entrance low on one side. The nest-building techniques of the two species, however, are strikingly different and their nests can be distinguished at every stage of construction.

By 7th June, the Pitta pair had nearly completed a large globular nest on their site. Many twigs were used for the superstructure and among the twigs were woven dried leaves, dried weed stems and pine needles. At the planter site the Crested Wood Partridges had scratched out a depression 2.5cm (1in) deep and 20cm (8in) across, and piled leaves and twigs in it. Later that day, the female Pitta was seen sitting in the Crested Wood Partridges' nest site. The male Pitta began bringing twigs to this site.

The pair of Pittas completed their nest on the Partridges' site on 10th June. Both male and female contributed to its construction. Both species were active on the site and in and out of the nest during this time.

Our experience with these two species indicates that Hooded Pittas lay one egg each day, for a clutch of one to four and begin incubating immediately after the last egg is laid. Both sexes seem to share equally in incubation. Crested Wood Partridges lay a clutch of two to seven eggs and may lay every day or every other day. Only the female incubates, starting sometime on the same day as the last egg is laid, and during the laying period spends very little time in or near the nest. The male does not go in the nest at all, although he often stands near it.

On 11th June the Pittas were observed with an egg. Three days later, three more eggs were observed under the Pittas. On the 16th both the Pittas and the Partridge female were seen using the nest. Between 16th and 22nd June, several conflicts were noted between the two species over the ownership of the nest. On several occasions, the female Partridge was seen to physically push the incubating Pitta from the nest and enter it herself. The Pittas would then stand nearby, vocalising, flicking

the wings open, and bobbing the tail furiously. For fear of disrupting the Pittas' first breeding attempt, the nest had not previously been closely examined. On the 22nd, a careful check revealed six Partridge eggs and one broken Pitta egg. The Crested Wood Partridges were moved to a different display and their eggs removed from the nest. The Pittas abandoned the nest on the same day.

Over the next few days, various attempts were made by both Pittas to build nests in several locations. On 29th June another almost complete nest was found on a rock ledge near the waterfall. The twig superstructure had the usual material woven into it and both birds were carrying dried cottonwood cambium for the lining.

The Pitta female was observed sitting in the completed nest on the 30th. The next day, the pair began taking turns in the nest, presumably incubating. Because of the inaccessibility of the nest and the fear of disturbing the birds, no attempt was made to verify the presence of eggs.

On 12th July, an egg was laid just outside the lip of the nest. This egg was removed and artificially incubated in a Petersime incubator (Model 4, Petersime Co., 300 North Bridge Street, Gettysburg, Ohio 45328) at 58% humidity, 28°C (86°F) wet bulb. This egg was fertile and developed for 14 days but died in the shell on 26th July, four days short of hatch.

Three days later, another egg was found outside the nest. This egg was returned to the nest by the keeper. On 22nd July, the nest began to fall apart but the birds continued to sit. They finally left the nest on 26th July after sitting continuously for 26 days, eight days longer than the incubation period for the species. The nest was checked and two cold eggs were found. Upon candling, they were found to be infertile.

On 28th July another nest superstructure was found on the ground under a splitleaf plant *Monstera deliciosa*. The birds continued to work on it until 2nd of August. Several days later it was abandoned completely. On 18th August the male began a post-breeding moult. The two Pittas resumed their solitary habits and remained at opposite ends of the display throughout the winter.

In 1988 the breeding pair began to show the first sign of interest in early March, chasing, tall-stretching, and giving the two-note advertising call. Nest-building began on 11th April and the first nest was completed on the 18th. Two eggs were laid on 22nd and 23rd, incubation beginning as soon as the second egg was laid. Both the male and the female contributed equally to nest construction and incubation. The incubating bird typically spent four hours on the nest before trading off with its mate.

After 18 days of continuous incubation, one egg hatched. The second egg was infertile and the parents rolled it into the back of the nest. Both parents took turns feeding and continuously brooding the chick. They

first began to leave it unattended for brief periods on 17th May, five days after hatching. At this time, the chick was alert, covered in pinfeathers, with the eyes well open. After this, the frequency of brooding dropped off rapidly. The parents continued to feed the chick attentively.

On 20th May the male began building a new nest at the opposite end of the exhibit. The next day the female joined in the nest-building activity. Both parents continued to feed the chick, which was now beginning to feather out. Building and chick-rearing continued simultaneously until the early morning of 25th May when the chick was found, limp and unresponsive, on the edge of the nest. It died half an hour later. Necropsy showed the gizzard to be tightly packed with a matted mass of indigestible plant fibres and coarse sand. The cloaca was impacted with gravel. Apparently the parents had begun feeding nest material to the chick when they started to line the new nest.

On the same day, the female laid the first egg of a second clutch in the new nest. She laid another egg each day for the next three days and began incubating when the clutch was complete. During the incubation period, the male was stepped on while lounging on the public walk and two toes of the right foot were broken. The foot was splinted and the bird returned to the exhibit. He continued to share in the incubation duties as though nothing had happened, despite being caught up several more times to check the foot and remove the splint.

This clutch hatched on the 16th day of incubation. All four eggs hatched on the same day. This time the parents rarely brooded the chicks during the day, spending all their time bringing food to the nest. The parents kept the nest scrupulously clean, removing all faecal sacs to the farthest point of the display.

All four chicks were healthy and developed rapidly. As with the first, lone chick, all had their eyes open and were alert and responsive by the end of the first week. At this stage, they looked remarkably like little black hedgehogs - the pinfeathers erupted completely before the sheaths started to open up so the birds were covered in long quills. They had wide faces, beady black eyes, and a short beak that tapered to an abrupt point like a snout. Their defensive behaviour in the nest was in keeping with their hedgehog-like appearance. If the nest was disturbed, the babies backed as far into it as possible, rumps in the air and heads tucked down under their shoulders, hiding their faces and making all the long quills bristle out.

These chicks were removed for hand-rearing on the eighth day after the parents were seen carrying wet, decaying leaves mixed with gravel to the nest. It was feared that they would begin feeding such inappropriate items to the chicks, as they had done before. The parents protested loudly,

getting under foot and attacking the keeper, when the chicks were removed. Three of the chicks were successfully hand-reared; the fourth died on the 17th day, apparently of an acute bacterial infection.

The day after the chicks were removed, the pair began building a third nest. They chose a bad site, however, one readily accessible to the public. The nest was broken up by the keeper several times a day for three days, until the birds gave up and selected a better site. Previously, all their nests had been built on the ground but this time they chose a 150mm(6in) square wooden ledge nailed on the wall a lattice over 2m (8ft) above the ground, which ordinarily held a food bowl. The bowl was removed and the birds completed the nest on 27th June, after working on it for eight days. Four eggs were laid on successive days from 28th June to 1st July, incubation again starting with the laying of the last egg of the clutch. All four hatched after 15 days of incubation.

For the first four days, the parents attentively cared for the chicks, as they had done with the previous brood. On the fifth day, the female was found in the early afternoon in another exhibit. It seems that a delay in the delivery of our live food items (crickets, mealworms and waxworms) that day caused the female to go hunting out of the exhibit. She was caught and put back in her own exhibit. She had been out for a maximum of one hour, but on her return she was at once attacked by the male. He drove her to the opposite end of the room from the nest and would not allow her to approach it, jealously guarding the chicks from this intruder and continuing to feed them faithfully. This went on for three days. The female lost 7g and was removed on the third day to another exhibit.

The male took excellent care of the chicks on his own. With the female absent, it seemed unlikely that he would begin to carry around nest material and feed it to the chicks, so it was decided to let him rear the brood to independence. However, on 25th July (day 10), he began limping on the left foot. Close examination showed the sole of the foot was fissured with deep cracks, probably the result of stress from favouring the broken toes of the right foot earlier. There was no option but to remove him for treatment and hand-rear the chicks. All four were successfully reared.

Discussion

Nesting: In addition to our successful breeding pair, the Denver Zoo has two other pairs of young Hooded Pittas, acquired in October 1987. Both of these young pairs have completed nests; one pair laid eggs but broke them all. The information on nest construction combines data from all completed nests, six built by the successful pair over two seasons and one each built by the young pairs.

In every case, the birds utilised an existing corner, nook or ledge as the starting point for the nest. One nest was built, as mentioned, on a wooden ledge; one was built in a hollow of a large, decaying stump; the rest were built on the ground, against a wall or corner, using to advantage the surrounding vegetation and preferentially placed on high ground. The birds began by constructing an arch of twigs which was then enclosed into a globe with a round entrance low on the front side. In the case of the nest built on the feed ledge, the birds first laid down a platform of twigs in which to wedge the uprights of the arch. All our Pittas preferred 15-25cm (6-10in) twigs about the diameter of a pencil. Twigs cut from Virginia creeper vines *Parthenocissus quinquefolia* were preferred above all others for the construction of the shell. The birds made no attempt to conceal their activities and worked throughout the day.

The twig shell was next reinforced and waterproofed by working in fresh and dried leaves and fern fronds, bark shreds, and decaying leaves mixed with earth. The successful breeding pair, which had the widest variety of materials available, used leaves of *Ficus* spp. and cottonwood *Populus* spp, *Bougainvillea* spp. leaves and flowers, fronds of Boston Ferns *Nephrolepis exalta bostonensis*, Maidenhair Ferns *Muehlenbeckia complexa*, squirrel's-foot ferns *Davillia griffithiana*, table ferns *Pteris* spp., hare's-foot ferns *Polypodium areum* and tree ferns *Cibotium* spp. (tree fern fronds, which are very touch, were cut into convenient lengths by the keeper); sprigs of Wandering Jew *Tradescantia fluminensis*, shredded cottonwood cambium, papyrus rootlets *Cyperus papyrus*, dried day lily leaves *Hemerocallis* spp., pine needles *Pinus* spp., and decaying plant matter. Most of these items were naturally available in the exhibit from the start.

The third stage of construction was the lining of the nest with fine fibres. Our birds preferred 125-200mm (5-8in) sisal fibres from shredded rope; they also used pine needles, fine, dried grass and fine cambium shreds. Shredded cotton twine and muslin threads were offered but not used. The experienced birds could complete a nest in five to eight days; inexperienced builders required much longer.

Diet: The diet available to our Hooded Pittas is a broad-spectrum soft-bill diet which covers the nutritional needs of a variety of species which share the Pittas' aviary. Of the food items available, either intentionally or unintentionally, the Hooded Pittas have been seen to eat soaked dog chow (Wayne's Brand, Wayne's Pet Division of Continental Grain Co., Chicago Illinois; Nebraska Brand Bird of Prey meat, Central Nebraska Packing, Inc. North Platte, Nebraska 69101), breaded meat (previous product breaded with Wayne's dog chow meal), Spectrum Brand Monkey Chow, Animal Spectrum Inc., P.O. Box 6307, Lincoln, Nebraska 68506-0307, raw pea-

nuts, and whole hardboiled eggs, blended in an industrial food processor), crickets, mealworms, waxworms, slugs, cockroaches, earthworms, centipedes, and occasionally finely chopped fruit. All non-live food items are dusted with bonemeal and vitamin-mineral powder (Vionate Brand, ARC Laboratories, P.O. Box 18884, Irvine, California 92713). The birds sometimes eat dirt, and grit is continuously available in the exhibit.

The breeding pair was observed to feed all of the above, with the exception of fruit and centipedes, to chicks. However, they showed a very strong preference for waxworms as chick food, followed by mealworms, crickets and earthworms. The remaining food items were offered with no clear pattern of preference when more favoured items were unavailable. Because of the definite food preferences shown by the parent birds, waxworms, mealworms and 9mm (3/8in) crickets were tossed to them six to eight times per day when chicks were present. Undoubtedly, the continuous availability of these highly preferred live food items contributed significantly to the chick-rearing success of our pair.

Hand-rearing: In both cases, the hand-reared broods were removed from the parents' nest and placed together in a large artificial finch basket tipped on its side and lined with dried grass and sphagnum. This 'nest' was put in a 40 x 30 x 35cm (16 x 12 x 14in) wooden brooder box with Plexiglass (Perspex) slides for the top and front. The box was kept at 32°C (95°F) by a 25-watt light bulb during the day and a heating pad under the box at night until the chicks fledged.

While the chicks remained in the nest, they were easy to feed. After overcoming the inevitable initial hesitation to accept food from forceps, they gaped readily. They were fed to satiation once an hour from dawn to dusk. The diet consisted of soaked dog chow, chopped newly-born mice, and meat dusted with bonemeal and vitamin powder, waxworms, mealworms (heads crushed with forceps first), and whole 9mm crickets. All food items were dipped in water before feeding. The second brood was also fed a 'Pitta Mix' made of ¼ cup soaked dog chow, ¼ cup meat, one hard-boiled egg yolk, 1/8 teaspoon bonemeal, and a pinch of vitamin powder mashed well to mix. The Pitta chicks seemed to like this mixture and other birds which were offered it took it eagerly also. The favourite food items were waxworms, 9mm crickets, and chopped newly-born mice. A chick would typically accept 15-20 waxworms, 10-12 crickets, or 8-10 pieces of baby mouse per feeding.

Both broods fledged on day 12 from hatch. The nest was removed from the brooder box and the bottom of the box lined with hay and dry leaves. Several perch twigs were placed in the box and, most of the time, the chicks preferred to perch on these twigs rather than stand on the floor of the box.

On day 14, the first brood was separated and each chick placed in its own 60 x 60 x 60cm (2 x 2 x 2ft) wire mesh cage, lined with hay and provided with perch twigs and water and food bowls. The second brood was placed, all together, in a mesh cage 1.2 x 1.2 x 1.2m (4 x 4 x 4ft), also lined with hay bedding. In addition to perch twigs, this cage contained several dense sprays of silk foliage for sight barriers, which the birds did use to hide in. All the chicks showed an immediate interest in bathing in their water dishes and thereafter would bathe several times a day.

The second arrangement proved to be the better by far. Pittas are not sociable birds and the ones which were put in separate cages soon became very territorial and could not be put together, even in a larger cage, without serious fighting. The group housed together from the start in a larger cage never fought. This group also weaned themselves from hand-feeding a full ten days earlier than the birds housed singly.

After fledging, all the chicks lost their appetites for two days, refusing to beg and regurgitating food if force-fed. Although they began to eat again on the third day, they became infuriatingly difficult to hand-feed, begging loudly and constantly but backing away, turning aside the head, closing the mouth, or running away as the food was presented. They were fed every one and a half hours for about two weeks after fledging, then every two hours until weaned. The group housed together began eating reliably on their own at day 35. The birds housed singly weaned themselves around day 45.

The first food item to attract their interest was live crickets. These were offered in a steep-sided, smooth plastic tub with pebbles in the bottom. Most of the crickets tried to hide in the pebbles and the birds soon learned to stand in the tub and pick them out. Crickets that jumped out were quickly chased down and eaten. Several days after learning to catch crickets, the chicks began to eat waxworms and mealworms out of a low dish and within seven to ten days had learned to take meat, soaked dog chow, pitta mix, and chopped, newborn mice from the dish also.

When removed for hand-rearing at day 8, the first brood of four birds ranged in weight from 36.4g to 44.1g. The second brood, removed at day 10, weighed from 38.7g to 41.8g. All chicks were weighed twice a day, usually at 0800 hrs. and at 1630 hrs., for about two weeks, and then once a day until it was felt that they were well established. Their daily weights fluctuated maddeningly but showed an overall slow gaining trend. The range of weights at fledging for eight birds was 36.0g to 43.2g, average 39.5g. The range of weights at weaning for seven birds (one died) was 44.1g to 59.2g, average 50.1g. A healthy adult weighs 63-68g.

The juvenile plumage of the Hooded Pitta is similar to the adult plumage, but all colours are muted and dull. The crown of the head is a

light brown, the face and neck are dull black. The upper back is a dusty olive-grey, the lower back turquoise-grey, the rump is a dull and vaguely iridescent turquoise, and the tail is dull black. The wings are dusty olive-grey, shading out to turquoise-grey and differ from the adult in having five dull white spots on the coverts. The primaries are dusty black on the leading edge shading to dark turquoise-grey on the trailing edge. The belly feathers are a pale salmon-pink and shade into the light ash-brown of the breast. The beak is black with the tip and the commissure bright orange.

The response of hand-reared Hooded Pittas to humans is very satisfactory. The birds do not actually like people and avoid contact and handling like wild birds. When caught up, however, they do not suffer the same stress and panic as wild birds do, a feature which is to their advantage in a captive setting.

ACKNOWLEDGEMENT

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* * *

REMINISCENCES OF RARE MUNIAS PART I

By ROBIN RESTALL
(Hong Kong)

The word 'rare' in the title of these notes is intended to be comparative, and not necessarily absolute. The Tri-coloured Munia *Lonchura m. malacca*, for example, would hardly be described as rare by anybody (yet there is a rare morph that occurs naturally in the wild). On the other hand, the Black Munia *L. stygia*, has probably only been seen by a handful of readers. And what of the Grand Valley Munia *L. teerinki*? Having hopefully provoked the reader's interest, allow me to digress at the start to explain my circumstances, and thus avoid prompting questions that might arise later, but will be unanswered.

I returned to England to live in London, in September 1984, after an absence of 19 years. For over 28 years now I have worked for an international advertising agency, and continue to do so. My assignment in England was to last four years and was to be responsible for one of our major worldwide clients. This meant visiting many countries all over the world every year. Unfortunately, a job that keeps one travelling (I was out of England for a total of 26 weeks in 1988) does not allow much time for a private life. I'm now an expert on taxi cabs, hotels and restaurants in some 26 countries, but my ornithological and avicultural experiences lag way behind.

Nonetheless, I have managed to meet many different kinds of bird people, from conservationists to trappers, museum curators to shippers, bird watchers to bird keepers, and, of course, aviculturists, zoos and bird markets. So this crazy peripatetic life of mine these past five years has obviously had some great upsides. The downside, however, has meant being away from home more often than is good for a serious bird keeper. When I'm home I struggle to catch up with my birds, but my wife and family also need rather more attention. It has also meant that my bird-room has lacked the quality and quantity of attention it really needs.

For the last 40 years I have kept and studied finches, and during my four years in England I concentrated on those finches I'd been unable to keep in the past. Since leaving England in the mid-1960s, I've lived in North and South America, Europe and Japan, and I have concentrated on the local birds every time. I guessed that my career would take me next to the Americas again, so while in England I did my best to concentrate on rare Asian finches. And that brings me to the subject of this paper. These

notes or reminiscences deal with one single genus, the *Lonchura*. I have already written about some species in this genus in the *Avicultural Magazine* recently so it might be appropriate to begin with a postscript to the notes on the complicated subspecies *L.m. malacca*.

The TRI-COLOURED MUNIA *L.m. malacca* was one of the commonest of imported finches in the period after the war when most birds imported from Asia came from Bombay. They came with Avadavats and Indian Silverbills and it was common for immature Nuns, as the munias were called, the Avadavats in eclipse plumage and the Silverbills to be coloured with a vegetable dye - either yellow, green or red. The Tri-colours were the first birds I ever kept, in 1947. I well remember a friend, many years ago, telling me that there were two kinds of Tri-coloured Munia - one with the white breast and belly, the other cream. He had seen a small black and white photograph of the two morphs in a German magazine. I thought at the time that the cream-breasted bird would have been a first year adult and the cream would moult white the following year, and forgot about it. Then, a year or so ago, I was invited to talk at a meeting of the East Anglia branch of the Australian Finch Society. Among the birds that members had brought along to sell were two pairs of a distinct morph of the Tri-coloured Munia that I had not seen before. The breast and flanks were creamy, and finely vermiculated. Each breast feather had a fine brown shaft line, and the edge of the feather was brown also. They belonged to Colin Rowe, who had spotted them in a shipment received by a dealer the year before. He had kept them through the moult, and they had all four moulted true. I understand there were a few others in that shipment. I also understand that some were included in a shipment received early in 1988.

I then remembered Malcolm Hough of *House of Feathers* sending me a corpse of this species, still lingering in my freezer awaiting a moment to be painted. I took it out and to my delight it too had the scaled breast feathering. Malcolm had kept the bird in his private collection for a couple of years and it had obviously moulted true. I have since seen a few in the holding cages filled with munias in the Bombay bird market. I am not sure if this is the 'cream-breasted' form that my friend saw in the German magazine, as I never saw the photograph, but I suspect that it is. My drawing (Fig. 1) risks being too bold, as the brown lines are not strong and outstanding. It is not the same pattern as the Indian Spice Birds *L.p. punctulata* or *L.p. subundulata*, and is definitely not a hybrid. My guess is that it occurs at the rate of about 3.0% of the population.

The GREY-CROWNED MUNIA *L. nevermanni* (Fig. 2) is an unusually

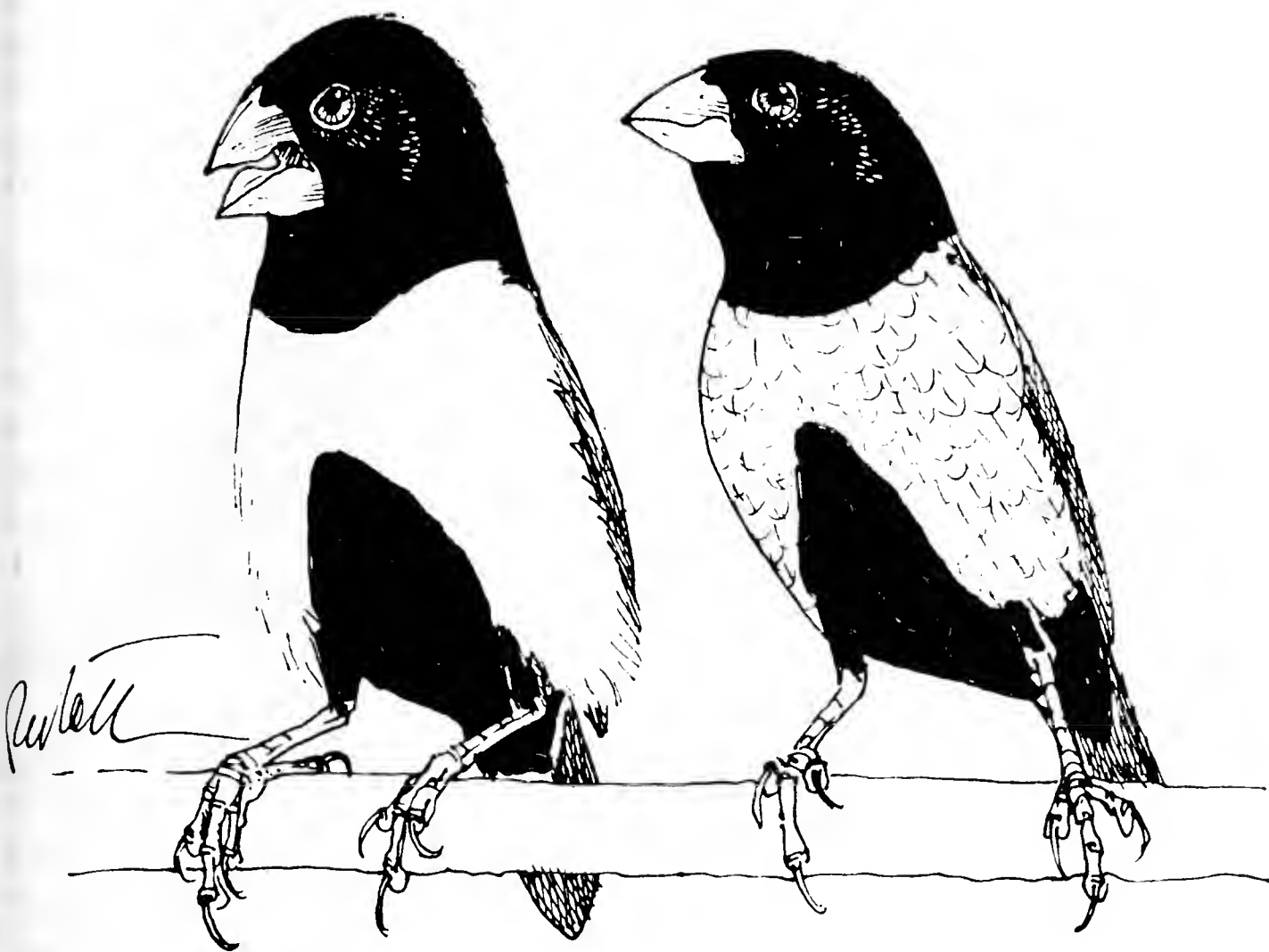


Fig. 1: Normal male Tri-coloured Munia (singing) alongside a scallop-breasted morph

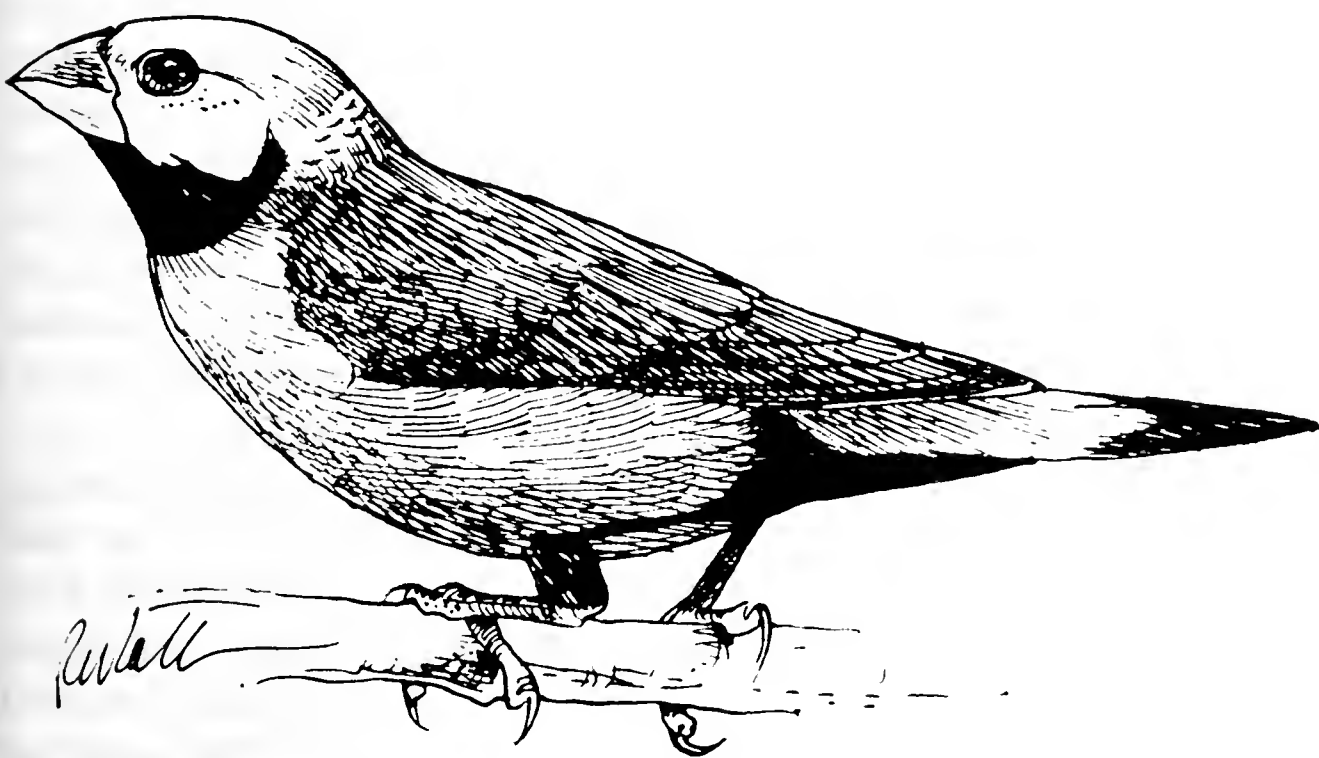


Fig 2: The Grey-crowned Munia *Lonchura nevermanni*

patterned munia from the island of New Guinea. Birds have reached Europe in very small numbers in recent years, and a few dozen were imported into England directly from Indonesia in 1988. It is a bird of savannah, grassy marshland, and the reed beds and grass banks along the sides of the rivers in the Trans-fly of southern West Irian Jaya and Papua New Guinea. It is locally common, but very rare in aviculture.

In size it is about 115mm long. The adult has a white face, crown and cheeks, graduating into a grey nape and sides of neck. The feathers of the nape have brown centres, giving a somewhat scaled appearance. The back, wings and tail are earth-brown; the rump and uppertail-coverts are chestnut-orange; vent and undertail-coverts black. The bill is blue-grey above, pale blue-grey below; legs and feet blue-grey. The sexes are alike but in birds that have moulted into final adult plumage the male is noticeably whiter on the face and crown than the female, and is more richly coloured on the breast and flanks.

Newly-fledged juveniles are a dull earthy-brown above and rusty-brown below, darker than typical immature munias. However, they quickly moult into first adult plumage when the black bib is speckled with brown, and the head is more greyish and flecked with brown. The rest of the body colours are a little duller than in the definitive adult plumage. In this condition it is easy to take one of these birds for a hen, selecting one with an all-black bib for a cock, but the former could as easily be a cock.

It is a very pretty munia, its distinctive head patterning lending it a quirky appearance of personality. It has a habit of stretching upwards, with head at a normal angle, looking around alertly, when the head takes on an arrow-head appearance. I have experience with them four times now and have found them to be delicate and unpredictable until they have moulted into final adult plumage, and are well and truly established. They are lively and alert. Males can be lively to the point of being bumptious, but females are definitely more delicate than males at any time. Birds that keep the feathers of the nape somewhat raised, giving a slightly bull-necked or hunched appearance are not well and should be hospitalised and kept in quarantine (by which I mean a secluded and peaceful cage) for several weeks, and even then should be watched carefully (Fig. 3).

The sexes of birds in the same plumage condition are alike, but, as mentioned above, in my experience the male has the white of the head cleaner and whiter. However, the best way to sex them when choosing from a cageful is to place a likely pair in separate cages and listen to their call notes. The call notes of males and females are slightly different in tone. I once selected two males and two females this way with Ron Miller, who had imported them from Indonesia, confessing that he could not tell any dif-

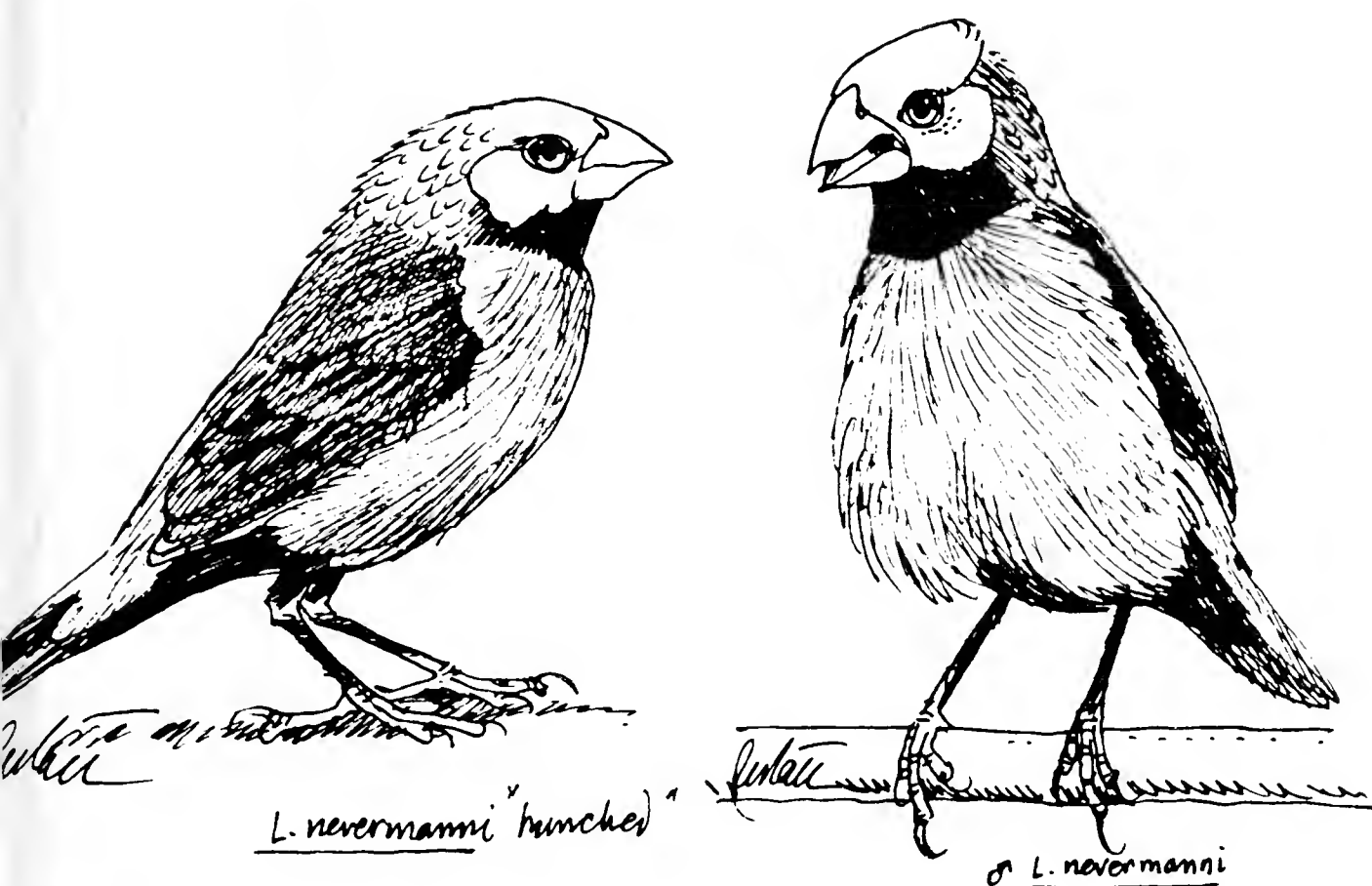


Fig. 3: Unwell bird in 'typical' hunched posture

Fig. 4: Male Grey-crowned Munia undirected singing

ference in the sounds at all. I cannot say that all munias can be sexed in this way but I now have several species confirmed. Of course, it is necessary to colour band the birds and keep notes on their subsequent behaviour. Of these four birds, two appeared to be whiter on the head than the other two, so I took a fifth bird with a darker head, hoping that it would be a female.

In their holding cage, all five birds roosted together in a roomy, half-open nest-box, but when released in the bird room took to roosting in the shadow underneath the overhang of some ornamental ferns placed on top of a flight cage. One male, banded Blue Left was seen to be singing freely on several occasions, always undirected. I saw him espy a *L. teerinki* alone nearby and he turned towards it still singing. Then, stopping for a moment, he grasped a bent of straw, flew across to the other bird and sang alongside it. The crown was raised (heightening the 'arrow' effect), breast fluffed and flanks spread. There was no dance or leg stretching, and no turning from side to side. The *L. teerinki* was unaffected and soon flew off.

Blue Left became very attached to Red Right and followed her around. This pair successfully took possession of a nest built and occu-

pied by a pair of *L. teerinki*, in the middle of a large roll of plastic fencing stuffed with hay and grasses.

Then I went off on one of my world travels, leaving the birds to efficient but inexperienced care. Upon my return 10 days later, Red Right was dead and Pale Blue Right was thick-necked. It went straight into a hospital cage with infra-red heat, vitaminised food, etc. The next day I caught up Lilac Right and placed her in the same cage; she was looking suspicious also. Incidentally, I caught PBR by dropping the door of the feeding cage. (For a feeding station, I use a large, all-wire flight cage - the type with two large doors.) LR was caught in a drop-top trap (bought in Spain 20 years ago) baited with mealworms. I find that fit and dynamic munias rarely, if ever touch mealworms, whereas sick ones will often chew them. This includes birds fresh out of quarantine, denied a wide variety of wholesome foods. PBR died but LR quickly became her old self. I had caught her in time.

Despite some nest building, the single female clearly never came into breeding condition that year. They have bred on the continent. Goodwin (1982) refers to Neff as being very successful in breeding them in Germany, and in a letter to the editor of *Cage and Aviary Birds*, a couple of years ago, a Mr. Nachrichter referred to two breeders producing young. To my knowledge, it has not bred in the UK yet.

At the time of writing this (December 1988) I have one male carrying a length of grass, holding it at the base end. It is a full stalk with a leaf and a chewed-out head of grass. He flies off purposefully, stops on a diagonal perch, looks round only to find the female not following. He then flies towards her, alights, hops towards her, then flies off in the same direction as before (from the main birdroom into the indoor aviary). She, instead, flies up to the open-fronted cage by the roof where there are some filled nest-boxes and baskets. He follows her with the grass and I cannot see what happens. It seems as though the male is attempting to draw the female to a nest of his choosing. She, as usual more successful, draws him to a site of her preference.

The BLACK MUNIA *L. stygia* (Fig. 5) is not black as its common name suggests, but it is the nearest thing to an all-black munia. The head and entire underparts are glossy black, the back wings and tail are dark brown; the rump and uppertail-coverts are yellowish. The male is noticeably darker on its back and wings than the female. I have not seen a juvenile but apparently it is greyish brown above with black centres to the crown feathers and buffish grey below. If this is the appearance of a juvenile, and not a bird moulting, then I suspect the black speckling on the head to be diagnostic of the species. But some



Fig. 5: Black Munia *Lonchura stygia*

young birds have been collected also showing blackish patches on the breast and some yellow on the rump, and these were undoubtedly moulting into first adult plumage.

It is a species of reed beds and marshy grassland country in the Transfly part of Papua New Guinea, at sea level. It must also occur in West Irian Jaya, where it has been collected in very small numbers for the bird trade. It is occasionally found in the company of Crimson Finches *Neochmia phaeton* and the Grey-crowned Munia *L. nevermanni* and it is undoubtedly in this circumstance that it has been trapped as the trappers are primarily concerned to catch the Crimson Finches.

I once ordered a pair from Germany, along with some other New Guinea munias. There was only one pair on offer. The 'hen' was dead on arrival and I never saw it, but it was obviously an immature because the 'male' turned out to be a female. She was a fine, sturdy bird that went out into the garden flight all the year round for two winters and it was a great sadness to me that I was never able to find her a male. At one point I had five Grand Munias *L. grandis* in the garden collection and the female Black Munia made a right nuisance of herself trying to get in on the act and steal a mate. Derek Goodwin says that *L. stygia* may be conspecific with *L. nevermanni*, but offers no explicit argument. I believe that hybrids between the two have occurred, so presumably on the Geographic Species Concept, they are constructed to be one species. I have always had difficulty with the GSC as an immaculate rule, however, and do so in this

case.

My flock of Grand Munias dwindled to one remaining cock bird and I caged him with the hen Black Munia for convenience and curiosity. They rapidly went to nest and laid, but again my travels intervened and I returned to find cold, dry eggs. The pair were released into the bird room along with the *L. nevermanni* and, while it is not surprising that the female Black did not pursue the male Grey-crowns, since she was reasonably well bonded to her 'super male', it is interesting that neither of the fit and singing Grey-crowned males ever approached her. Maybe they recognised her as being paired.

The odd couple quickly took command of an Amerindian basket that had been fixed sideways on to a wire mesh door with the handle acting as a perch. She left the male *grandis* to do all the work of nest-building which he did with great energy and dedication. She was active and aggressive in defending the nest against curious munias. Despite sitting tight for ages she never laid again (at least to my knowledge). Moulting, combined with dramatically changing weather, finished the breeding season.

I have a note of a letter from A. Nachrichter in 1986 that a breeder in Germany produced 27 young from five pairs in that year. So, while UK records are non-existent, this munia seems to be capable of doing well in captivity.

The GRAND MUNIA *L. grandis*, sometimes called the Grand-billed Munia, is logically the next species in the sequence. It is a big bird, about half-way in size between the Black-headed Munia and the Java Sparrow. The entire head and underparts except for the sides of the flanks (largely obscured by the folded wings) are black. In the hand, a fit, healthy bird has a slight green sheen to the black. The back, wings and sides of the flanks are chestnut; the rump is reddish-chestnut with a golden sheen and the uppertail-coverts are orange with a golden sheen. The tail is dark brown, edged with yellow. The bill is deep and heavy and disproportionately large compared with other munias; it is pale blue-grey, and the feet are slate-grey.

The adult female is on average about ten percent smaller and shorter than the male and you should have no difficulty in selecting true pairs by size. However, if you only have very few birds to choose from, be careful. I had one male and one female of identical size. Of eight birds owned by Patrick Tay in Singapore, I was able to sex accurately three males and three females, leaving two intermediate-sized birds as unknown. A year later those two birds had died leaving three obvious pairs. Patrick's birds were all banded with coloured plastic split-rings. It is also possible to separate the sexes of this species by the tone of the call note. I noticed

often how, when a pair of mine was separated, or a single bird was separated from the flock, its call note was different from that of its mate. Almost *peep* and *pi-pi*.

I have not seen the juvenile but understand from the literature that it is typical of the *malacca* type, but shows the black very early on.

I first obtained a trio, apparently a male and two females in October, 1986, the only birds of the species in a shipment from Germany. One of the birds was an obvious male, the other an obvious female. The intermediate-sized bird I took to be a female. They were fit, healthy birds and very quickly settled in. In February the importer called me with the offer of a pair returned to him by the original buyer. They had been imported, also from Germany, the previous February. They were in pathetic condition, the female totally bald from the shoulders upwards, and both with badly, heavily scaled feet and overgrown claws. How somebody can pay the high price that rare birds like these inevitably carry, then fail to look after them properly is beyond me. I fear that the 'more money than sense' syndrome is alive and well in aviculture. I kept these birds in a flight cage in the bird room. The original trio were run in the indoor/outdoor aviary.

The aviary flight was L-shaped and about 21ft (6.40m) long altogether, richly planted. The food available was a mixture of millets with a little canary seed in a large hopper, then my own mixture of small oil-rich seeds and long seeds like lettuce, untreated rough lawn grass mixtures, teasle, hemp, etc., originally blended for my parrot-finches, millet on the spray and daily lettuce. They fed freely from all of these showing no particular preference, and they fed on lettuce with eagerness.

The flock of five were very lively. There was much chasing about and excited chirruping that reminded me on several occasions of the community activity of the House Sparrow *Passer domesticus*. The original trio were active, investigating nest-sites with one obviously bonded pair usually chasing away the third bird that I took to be a female. I had only ever seen the big, obvious male sing. It was not until the intermediate-sized bird obviously accepted its rejection from the house-hunting team that it began singing. By now it was early summer 1987, the new male had died while in my own 'quarantine' but the female had grown new head feathers and was fit enough to be released into the flight. She was accepted immediately by the smaller male. The two pairs became a mini-flock and stayed together most of the time.

Despite the obvious size of the typical male, when four birds are interacting in a planted aviary, one is grateful for coloured split rings and an ever-handy pair of close-focus binoculars. It was with such that I was

able to observe the 'House Sparrow' behaviour. In fact, I think it was the two male birds fighting. The two females followed very closely, apparently chirruping as excitedly as the two males. The two males, locked together as a male/female pair of House Sparrows can be, would fall to the ground, the females perched about a metre above them. I could never tell which group stopped chirruping first but silence would fall and the birds would fly off I *think* led by the vanquished male.

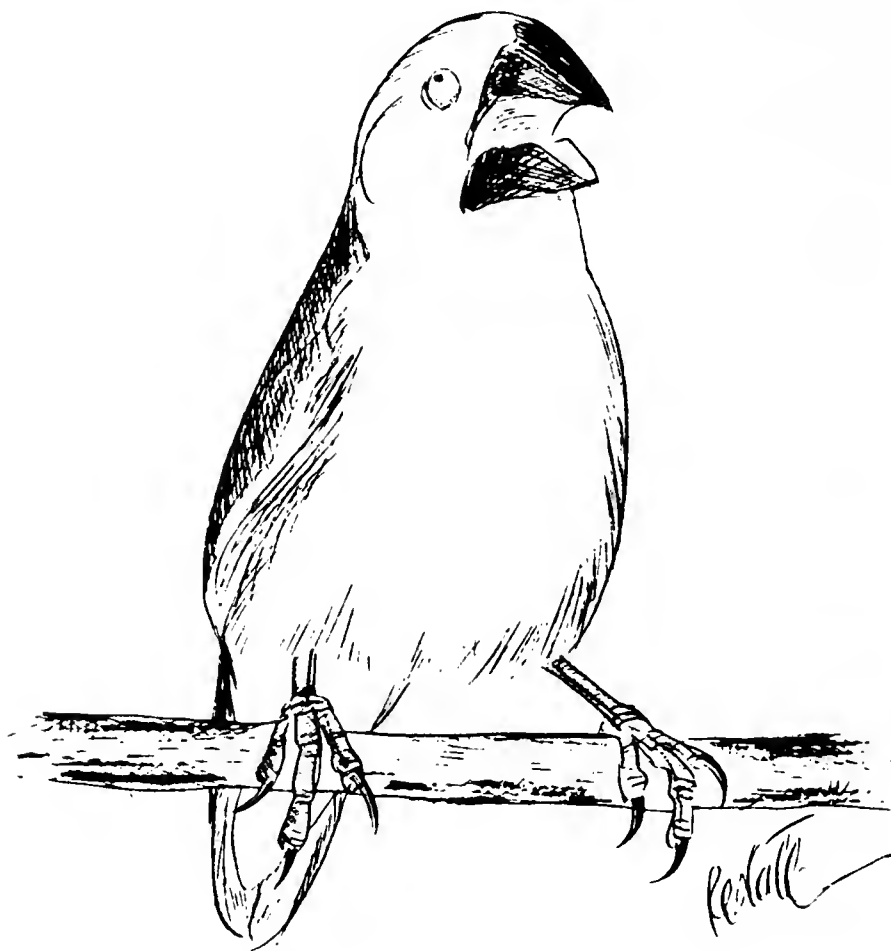


Fig. 6: Male Grand Munia undirected singing

In undirected singing, (Fig. 6) the male invariably faces forward, that is to say at right angles to the perch. The posture is fairly upright with the head held level or even *slightly* raised, the legs clearly visible. However, when singing to a nearby or adjacent female he will be turned slightly towards her leaning slightly over her, in a rather more crouched position. I never observed any bobbing by the male. In all instances recorded in my notebook, both birds remained still. At the end of the song the birds touched beaks and remained unmoving for several seconds (Fig. 7). They would then resume normal activity, usually by the female flying off, to be followed by the male. The whole episode might last some 20 seconds.

When an individual is separated from the group, it utters a plaintive *quire* sound, very loud when a mate or known bird replies, usually with

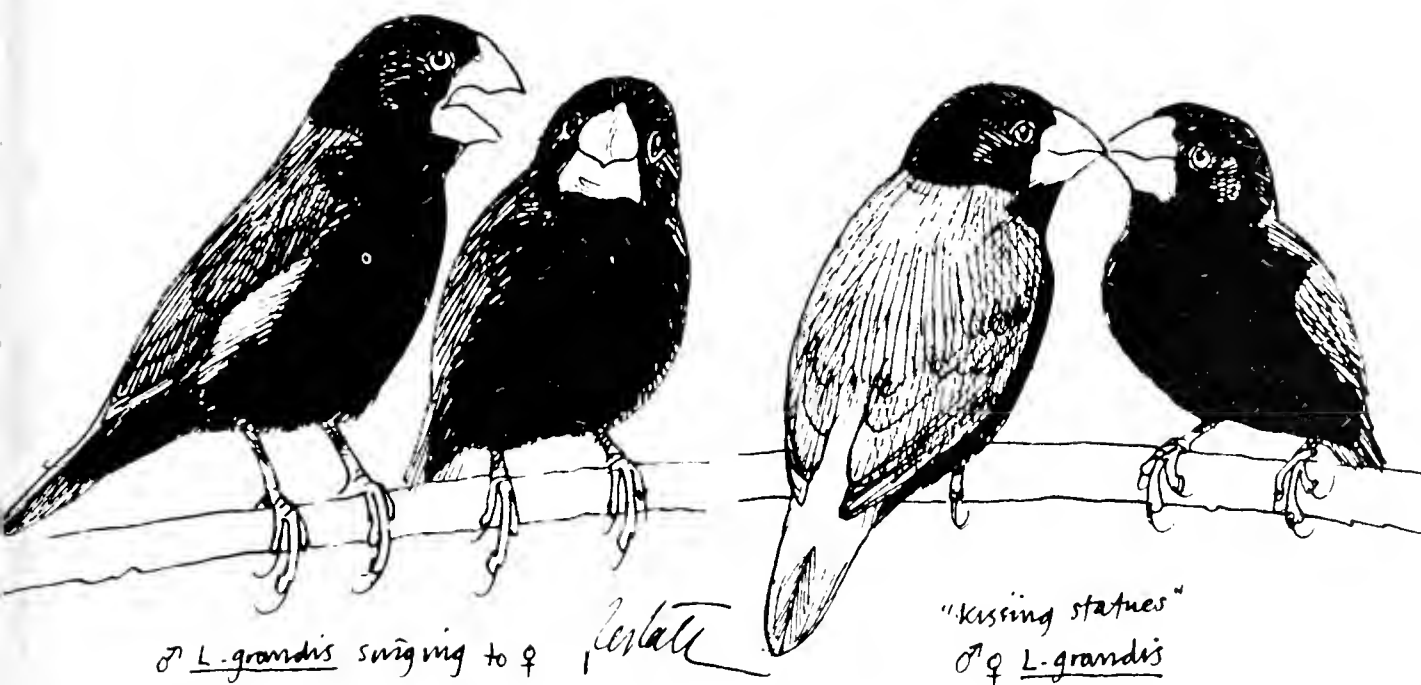


Fig. 7: Male *L. grandis* singing to female (l), followed by motionless bill touching (r)

equal anxiety of tone they rapidly switch to normal contact calls and you can hear clearly the slightly different tones of the male and female.

The only other voice that I noted was when the big male took possession of a nest cavity in one of the straw banks described in an earlier article (Fig. 8). From within the nest he emitted a long-drawn out *weee-*

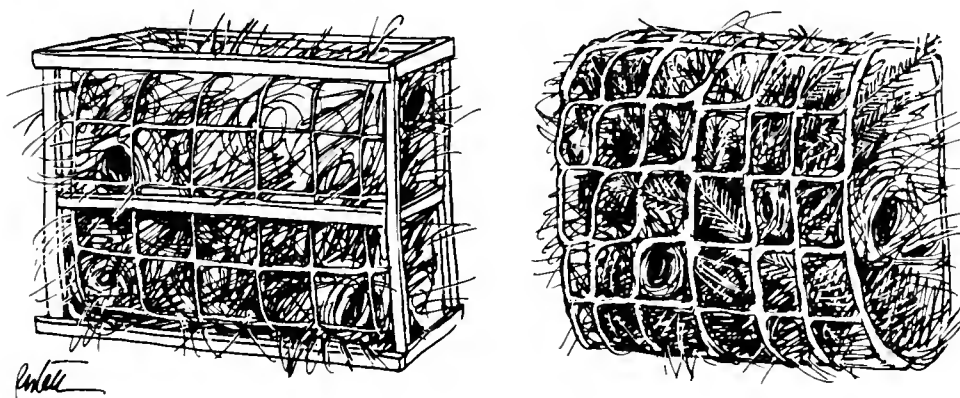


Fig. 8: Nesting sites used by the author for munias

weeee the source of which, to human ears, is very difficult to locate. The female, however, was drawn slowly but almost hypnotically to the site. She would go right up to the entrance but I never saw her go in.

When a pair went to nest seriously, the male would sit sentinel outside and chase away any other munia coming close. They are nervous nesters, approaching the nest with caution and entering directly. Despite the aggressive behaviour of the males to each other - and the females did their own chasing too - I never felt that the beligerence was negative. Maybe I am overdoing the House Sparrow comparison but I feel the aggressive behaviour was largely ritualised (there was never blood spilled nor a feather

pulled) and contributed to the females' ovulation. The two pairs nested within half a metre of each other in the same straw bank. Both laid long, narrow white eggs. One female died in the nest, the eggs had disappeared. The other pair deserted.

The story takes a new twist now. We all have had cats on the roof of our flights, but I have had children. During one of my many trips overseas, the next-door kids climbed on to the roof of the flight to retrieve some tennis balls, and two panels caved in about six inches or so. I returned to find half my birds gone, including the pair of Grand Munias. Encouraged by this enforced discipline in dealing with overcrowding, I caught up all the odd birds and caged them, leaving the flight to a very few lucky pairs of Mayr's Munias and some rare South American finches. The remaining male *grandis* went into a large, all-wire cage with the female *stygia* and a pair of Bengalese. The female Black Munia took immediate possession of the nest box and chased the Bengalese to the far corner of the cage. The male *grandis* sang intensely to her and she responded. I had to remove the Bengalese as they were denied all freedom of movement.

Left to themselves they behaved in a most interesting way. The male *grandis* would begin a frenetic flying back and forth from one end of the cage to the other, the *stygia* would usually but not always join in. It would invariably produce some energetic bill-fencing every time they perched on the same perch, and the exercise would end with bill fencing. I felt that this was an unnatural behaviour by the male *grandis* and given more room plus a female of the same species, would have manifest much more like the frenetic chasing, the sparrow-like activity. Obviously their respective behaviours produced ovulation because the hen did lay, although she sat well she eventually left the eggs. I opened the cage doors and allowed them the run of the bird room. The male soon found his way back and sat sentinel outside the nest-box. Although the *stygia* often returned to the cage, she ignored the nest, and soon took over an Amerindian basket hanging on the door in which a pair of *L. teerinki* had built a nest (Fig. 9).

The takeover was interesting. The *stygia* flew to the handle of the basket and sat there motionless, pointing at the entrance cavity. The male *grandis* flew to perch on top of the basket and sang continually, turning his head slightly from side to side. One *teerinki* fled within a minute, the other left five minutes later. Five seconds later, the female *stygia* entered the nest. For the rest of the day, the *teerinkis* attempted to return to their nest but one or other of the usurping odd couple was always inside and would chase them away, but never further than about 2m. The next day they began building more. The male *grandis* brought material and built

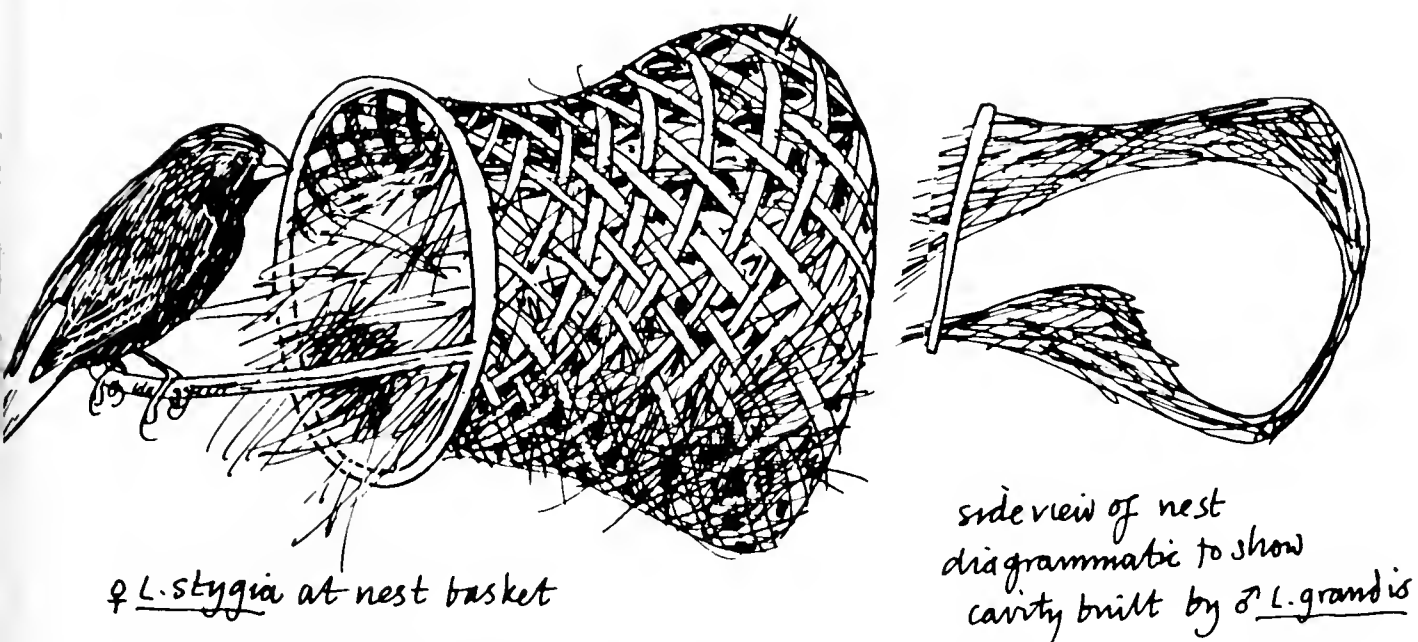


Fig9: Amerindian basket in which *L. teerinki* had built a nest, taken over by *L. stygia* (l). Cross section showing internal structure (r).

the nest. From the perfectly adequate nest built by the *teerinki* pair he constructed a more elaborate tunnel that eventually completely obscured the handle-cum-perch, and the nest could only be entered from an oblique lower angle. The *grandis* would always take a straw by one end, fly to the nest entrance, wait a moment in perfect stillness, then enter. Two weeks later, still no eggs, but I once saw the *stygia* take a straw about 5in long, holding it at one end, fly on to the top of the nest-basket and attempt to weave it into the top of the basket. The male *grandis* watched for about five minutes from a distance of a metre or so, then he flew to the nest and, from the movements of it, was obviously working on the inside. The female then dropped the straw and flew around to the entrance of the nest.

With the extraordinary weather changes of September and October came a falling off of nesting activity in the bird room and they deserted their nest.

To be continued in the next issue

* * *

As a footnote to the above, since writing these notes my wife and I have moved to Hong Kong, and thus started another chapter in the bird life of the Restalls. I have also heard that Mick Plose has bred the White-crowned Munia *L. nevermanni*, in a small garden aviary. I have also heard that there have been recent importations of Papua New Guinea munias and would very much like to exchange correspondence with any reader with experience of them. Please write to me at 31 South Bay Road, Hong Kong.

REPEATED BREEDING: QUESTIONS AND SUGGESTIONS

By DEREK GOODWIN

(Petts Wood, Kent)

As will be well known to most of my readers, many species of birds in captivity will, if permitted, continue to breed (or attempt to breed) for many months or even years without a break or with a break only during the main period of the moult. The Budgerigar, Zebra Finch and Diamond Dove are well-known examples but many other doves and estrildid finches come into the same category. Many of these are, in a wild state, birds of arid country that come into breeding condition whenever rainfall or other conditions produce (or sometimes as soon as they 'promise') plentiful supplies of suitable rearing foods.

Other species, such as the Canary, will breed over an extended period, having or attempting to have, nest after nest from late winter until the moult, or the most complete stage of it, puts an end to such activities. Many wild birds of temperate regions behave very similarly. Our Blackbird *Turdus merula* and Song Thrush *T. philomelos*, for example, often lay their first clutches of eggs in March and their last in July and, like many other species, may actually be feeding young while in their post-breeding moult.

Almost every book on bird keeping that I have read, whether written by authors who are primarily fanciers, aviculturists or by ornithologists, warns us not to let our parrots, doves or passerine birds have more than two or three successive broods. If we let them have more, and especially if we let them go on as long as *they* like, they will, we are assured, not only be weakened themselves thereby but will produce weakly, third-rate offspring. Always implicit, and sometimes explicit, in this advice is that the sexes must be separated and/or kept under conditions that prevent them from nesting for much of the year and for much of their lives. But is this belief true? If it is true, may not the recommended 'cure' be sometimes more objectionable than the (alleged) evils it seeks to remedy?

Taking first the claim that if the hens are allowed to lay more eggs than they would in a wild state, indeed in some cases if they are even allowed to lay as many, these eggs would be deficient in one way or another and produce inferior young. Will they? Or will they only if the bird producing them is inadequately fed? It is noteworthy that although this claim is made for wild birds in captivity and also for domesticated

species such as the Canary and Budgerigar, it is not, or at least was not when I was involved with domestic fowls (circa 1936-1950) made about domestic poultry. Though fowls kept for breeding were usually kept under better conditions and given less 'forcing' a diet (less protein and no spices in the food) than those intended simply for egg production, still they were expected to lay, and did lay, a very much greater number of eggs, all of which were used without hesitation for hatching purposes, than would any wild Jungle Fowl. The same applied to domestic Turkeys, ducks and geese.

Breeders of ornamental waterfowl and pheasants, by robbing their birds of their eggs and rich feeding, commonly induce them to lay very many more eggs than they would do in a natural state (or in captivity) if all went well and they were permitted to incubate the first clutch. Since these 'extra' eggs are used for hatching purposes, the breeders of these birds clearly regard them as suitable to produce young from.

So, in effect, 'conventional wisdom' says: "If passerine birds, parrots or doves lay more eggs than they would in a wild state *if all went well*, these eggs *must* be inferior in quality and unsuitable for breeding purposes but this is *not* the case with gamebirds and waterfowl, nor with domestic poultry." Is this really so? And, if it is so, is the cause a real difference between the bird families concerned or is it merely due to differences in nutrition affecting the worth of the eggs? I throw the question open to readers and hope that some can answer it or give an opinion based on actual experience.

There is, however, another aspect to the matter or related to it. When, for whatever reason, one does not want one's birds repeatedly to produce more young, what is the best, by which I mean most humane as well as efficient, means to this end? Cat 'lovers' usually have their pets castrated or spayed, according to sex, and the 'well-looked after' dog or bitch is, as a matter of course and without pity, subjected to tortures akin to those of Tantalus in the matters of both food and sex. But bird keepers are generally expected to be more considerate towards the creatures in their power. I certainly believe that we should be.

Separating the sexes is often advocated. It is certainly effective. It is also troublesome to the owner, to an extent varying with different species. More important, unless the birds are out of hearing of each other a great deal of frustration and stress is suffered by them, as mates or potential mates continually hear and answer each other's calls and attempt to escape and get together. If they are (by the occasional very rich owner with far-flung aviaries or sound-proof rooms) moved out of hearing of each other, species that form strong pair bonds and thus suffer most from being parted are likely to form firm homosexual or inter-specific pairs when thus

separated from conspecifics of the opposite sex, thus posing problems for the owner if he or she ever does want to breed from them again.

Thus, separating the sexes is certainly not a humane solution, and not always a convenient one for the owner.

Leaving the sexes together but removing all possible nest sites is an often advocated solution. It is certainly efficient in the case of some obligatory hole-nesters, but others, for example, the Zebra Finch, Canary and Barbary Dove, will contrive to make a nest of some sort and to lay eggs unless kept in very barely furnished aviaries or cages. In the case of the Zebra Finch, many other estrildids and, I believe, some American parrots, the birds normally roost in old nests and/or holes, so that forcing them to roost nightly on a bare perch is itself a considerable deprivation.

Some species, such as the Muscovy Duck, which sit for long periods if their eggs are sterile, and which feed little while incubating, or rather in their brief respites from it, undoubtedly get into very poor shape if allowed to sit 'as long as they want to'. But in species, like doves and estrildids, in which both cock and hen share incubation, or in which, as in the Canary and the Jay, the sitting hen is fed by the cock, I have not known a bird of either sex ever look any the worse for sitting beyond its time.

I read of a keen German keeper of Zebra Finches who thought the best way to solve this problem in that species was to allow the birds to nest and incubate sterilised eggs for as long as they wished to do so, then letting them go to nest again and again sterilising the eggs. I have adopted the same tactics with cordon-bleus *Uraeginthus* spp. without any observed ill effects and I had the impression that birds so treated seemed happier than others (or they themselves on other occasions) had been when deprived of possible nesting sites and nesting material.

I, and I hope other readers also, would be interested to hear the opinions and practices of others in this matter also.

* * *

BIRD ACOUSTICS IN RUSSIA

Tapes of birds and other animals in the service of pure and applied Soviet science

(Continued from previous issue)

By JEFFERY BOSWALL

(Birdswell, Wraxall, Bristol)

PART 2

The most bizarre wild bird problem solved by bioacoustic means in Soviet Russia concerns the Hooded Crows that used the onion-shaped roofs of the Kremlin Cathedrals for dry ski-ing. The problem was that, in playfully sliding down the steep slopes of the cathedral domes ('krem-lin' means a citadel within a town and may protect religious as well as administrative buildings), the birds' sharp claws scraped the gilt from the expensively renovated surfaces. Further, Soviet office workers were distracted by the raucous cawing that accompanied this playful behaviour. The All-Union Research Institute for Nature Conservation was called in to advise, and Dr. Alexander Sorokin came up with an ingenious answer. The vocal repertoire of the Hooded Crow had been well studied and it was known that one call was a cry given when a crow is captured by an enemy, say, a bird of prey. This cry has a rallying effect on other crows within earshot. The biological function of this cry is in itself interesting. Natural selection's idea is said to be that if you are a crow struggling in the talons of a falcon and you utter this distinctive cry, then other crows will rally and maybe so harass the falcon that it lets you go. Now, by playing such a cry through a loudspeaker, it was possible to get the crows of the Kremlin to gather in the vicinity of the loudspeaker. But when they did so, they found not a falcon on the ground 'mantling' its prey but a falcon flying free and low above them having just been launched from a Russian falconer's fist! This the crows found unnerving. Next, train a couple of Kremlin workers to perform this double act two or three times a week and you can effectively keep the area clear of crows.

I would not have believed this account but for the scientific reputation (and established sobriety) of my Russian informant, and the fact that the crow family is the most highly evolved of the 150 living families of birds. Many remarkable behavioural feats, including the manipulative use of objects as tools, are known to be performed by Jays *Garrulus glandarius*, Magpies *Pica pica*, Jackdaws *Corvus monedula*, Ravens *C. corax* and other members of the crow family. One recent account of two Ravens repeatedly 'tobogganing' on their backs down a snow slope (supported by photo-

graphs!) is the closest behaviour I know to the 'ski-ing' by the crows of the Kremlin.

An even more remarkable account of crow behaviour was given to me in Russia of how Jackdaws learnt to break into a hangar in which aircraft were maintained and repaired. The birds were accustomed to nesting inside the building, under the roof, and (like the well-known thieving Magpie) were wont to take up and play with loose nuts and bolts lying about. When first locked out of the hangar, birds tried to break the glass roof panels with their beaks. Failing with that method, they later dropped from a height nuts and bolts on to the glass and successfully gained entry! By way of lending plausibility to the account it should be mentioned that other members of the crow family (but not Jackdaws) are known to drop hard-shelled food objects like mussels and walnuts to break them open. So the glass-breaking behaviour is that much less surprising. But I digress; for this problem was not susceptible of a sound playback solution.

A different problem was a scientific one. The Ural Owl *Strix uralensis* was almost unknown in Latvia until special 'owl prowls' were organised as part of a scheme to plot the breeding distribution of all Latvia's breeding birds (over 200 species) on a 10 x 10km grid. The organiser of the census, which was repeated over five years, was Janis J. Priednieks of the Latvian State University at Riga. He issued playback tapes which a number of his eager volunteers played at night in suitably wooded places. The method proved an outstanding success. Ural Owls proclaimed their presence in response to apparent intruders, from well over 50 squares in the north and east of the country; sometimes as many as 10 territorial males in one square responding.

By reproducing a squeaking noise, another group of Latvian ornithologists set a world record during the autumn migration of 1975. They lured into a trap on the Baltic coast of Latvia at a place called Pape, within one month, nearly a thousand Long-eared Owls *Asio otus*. On the last night no less than 214 owls were caught and then 'ringed' with numbered identity bracelets before being released. Some were soon found in winter quarters to the south-west in Germany, France and Britain; others turned up the following spring on their nesting grounds to the north-east in Estonia and Finland. But origins and destinations of these Latvian birds of passage would have remained significantly less well-known but for Guntis Graubics having got on to their wavelength with a sound that the owls apparently thought was the cry of a bird in distress and thus became easy prey.

Sound recordings of natural environments have come to play a role in Soviet psychotherapy. The playing of environmental recordings to post-coronary convalescents is part of the usual pattern of recovery, as it is of the treatment of patients with neurological problems. Hospitalised children

are also helped in this way. Soviet cosmonauts are similarly soothed in space by tapes of birdsong, falling rain and rustling trees. In a progress report on Vladimir Dzhanibekov and Victor Savinykh after two months in space on board Soyuz T-13, it was said that they had been helped to overcome nostalgia and the problem of 'cosmic silence' with tape recordings of Russian nature. 'It is these sounds, so customary to the ear on earth, sounds that we may not even notice in the hustle and bustle of daily life, that help cosmonauts in orbit to overcome fatigue', the report said. Turning to the future possibility of permanently manned space stations, the report says that specialists were at work on the problems of the psychological effects of long-term stays in orbit. Wildlife tape recordings could easily prove a vital factor in reducing homesickness.

For his work in the field of applied bioacoustics, a young Moscow zoologist, Alexander Tikhonov, was recently awarded the Lenin Komsomol Prize. By playing appropriate sounds as hatching time approached to the embryos of domestic chickens still inside their eggshells, he reduced by several days the incubation period in the giant industrial incubators, thus improving productivity. Further, by playing the cackling cry of the mother hen the chicks emerged more synchronously within 30 minutes instead of within 24 hours, and thus more incubator time was saved.

We come now to the role of sound recording in the popularisation of science through disc and cassette, T.V. and radio. Sound recordings are used in radio programmes in a number of Soviet republics. Sabine's Gull *Larus sabini* was the subject of a recent five-minute broadcast on Radio Moscow's domestic service. Igor D. Nikolsky has broadcast about 75 little talks over the last 15 years under the title *Native Nature*. The word-picture about Sabine's Gull took his listeners to the Chukotka peninsula on the 'home' side of the Bering Strait, opposite Alaska.

ABC of Nature (*Looduse aabits* in Estonian) is broadcast in Estonian in stereo for 10 minutes at 7.10 p.m. on Tuesdays, on the third radio channel. I have heard No. 39 (of 47 programmes) first transmitted on 31st December. After an introduction, the listener hears a crow cawing three times. This is the signal for teachers, naturalists and others interested to start their tape recorders. On this programme we heard the cries and songs of the Blackbird *Turdus merula*, Great Tit *Parus major*, Bullfinch *Pyrrhula pyrrhula* and Chaffinch *Fringilla coelebs*. Anyone with enough persistence to tape all 47 programmes, over the best part of a year, would have in his assembled 'radio part-work' the voices of no less than 250 species of bird, mammal, amphibian and insect.

The deviser and presenter of the series is Fred Jussi, an Estonian freelance nature writer, photographer and tape recordist. He is utterly committed to the cause of wildlife conservation and is determined to use

words, pictures and sounds to educate people to this end. Two L.Ps of his, produced in co-operation with the Estonian Radio, present (i) the natural sounds of the Matsalu Nature Reserve on the shores of the Gulf of Finland, famous for its autumn assembly of 10,000 trumpeting Cranes *Grus grus* on their way south, and (ii) the aural settings of Estonia's Lahemaa National Park.

The very first phonograph record in the world to present the voice of a bird was pressed in Riga in 1911. Not surprisingly, the Nightingale *Luscinia megarhynchos*, the classic European songster, was chosen to make this technological debut. Since then nearly one hundred discs have been produced in the USSR.

Some of the discs are for popular use, including those of wild choruses direct from nature and those from zoos. Others are of educational or scientific value. One is a major contribution to economic ornithology: its purpose is bird scaring.

A more direct use of recordings for conservation is the Red Data Disc, an album that brings together the cries of endangered Soviet creatures like the Altai Tiger *Panthera tigris altaicus*, the Snow Leopard *Panthera uncia*, and the Hooded Crane *Grus monacha*. The recording of the crane was made at the very first nest ever found by a scientist. This was as recently as 1974 when Yuri Pukinsky, working in the valley of the Bikin river north of Vladivostok, discovered a nest and tape-recorded the bugling adults and their hatching chicks. Only in the Soviet Union has the Red Data Book idea, invented by the British conservationist, Sir Peter Scott, taken off on phonograph records: bioacoustics in the cause of nature conservation.

A series of strictly educational phonograph records was commissioned by the Soviet Ministry of Education. The accompanying texts are exceptionally informative and vital to a full understanding of, for example, the recordings of the frog and toad language of Russia. One among eight vocalists is the Fire-bellied Toad *Bombina bombina* (which clearly has fire in its belly about *something*) taped at the Khopyor nature reserve near Voronezh in the Russian Federated Republic. The record sleeve is helpfully decorated with colour paintings of the amphibians by Yuri Smirin. The discs sold for about 75p. each, mainly to schools: bioacoustics in the cause of education! Several thousand copies of each were pressed.

Of more popular discs, no less than 250,000 are pressed. Once a month there appears on Soviet bookstalls a publication called *Krugozor*. It is a combination of lightweight discs, 9cm in diameter and square pages, 9cm x 9cm! Plastic and laminated paper alike have a hole in the middle and a spiral binding allows discs to be opened like pages, *and* folded back

for placing on a phonograph turntable. I have not seen a comparable format in the West. Anyway, most of the disc sides are devoted to music, a few to speech and effect, and once or twice a year there is a wildlife sound-article. One such, under the heading 'Concern for the Future', included the voices of rare birds such as the Crested Ibis *Nipponia nippon* and Steller's Albatross *Diomedea albatrus*, both taped in Japan.

One disc, first produced in 1960 and still on the market, even today, has sold with its immediate successors under the same series title, two million copies world-wide in several languages, including English, French, and Japanese. The series is called *The Voices of Birds in Nature* and includes the music of the Eastern Nightingale *Luscinia luscinia*, and the fluting of the Golden Oriole *Oriolus oriolus*; also the spring croaking of Marsh Frogs *Rana ridibunda*. On the 25th anniversary of its publication, the recordist, friend Boris, appeared on the Soviet fortnightly television programme *In the World of Animals* as the guest of his long-standing friend Vasily Peshkov, the well-known and much respected conservation writer for *Komsomolskaya Pravda (Truth for Youth)*. This programme, transmitted at prime time on Saturday evening and re-run twice within seven days, gets an astounding 92 million viewers, more than any other wildlife television show on earth. Peshkov and Veprintsev discussed the amazing volume of sales of the disc (also easily a world record for wildlife discs) and led on to the importance of all media, television and film, magazine and book, disc and cassette, in increasing the awareness of wilderness values by the proletariat.

Yet another recent Soviet disc is sheer entertainment, and nothing wrong with that. It also has scientific value, since the ability of Gosha, a Budgerigar *Melopsittacus undulatus* to build the astonishingly rich vocabulary of several hundred words is of some significance. The bird was trained from the age of 23 days old and was still picking up new words at four years old. It can even recite the works of the distinguished Soviet poet, Chukovsky. Gosha is also reliably reputed to indulge in the kind of language attributed to parrots brought home by sailors. But none of this appears on the record.

To date, nearly one hundred discs of natural sound of all kinds have been issued in the Soviet Union. They sit alongside a rest-of-the-world record collection in Boris Veprintsev's Soviet Archive of Wildlife Sounds. Only one man has played the lot. Pavel Mitrofanov, a retired Leningrad teacher of biology, has spent hundreds of hours not only playing the 500 records but also compiling an index of the 3,000 species that give voice from their grooves. His wife calls it a 'noisy game'! He has added to the scientific (usually Latin) names, the Russian names and English names and, where appropriate, those in French, German and Spanish. Let us hope

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that computer print-outs of this incredible lexicon will be made available internationally.

The catalogue of *unpublished* Soviet recordings is already in print. At the last count, no less than 500 species' voices are held on tape in the archive. New ones are being added all the time. Indeed, each year Boris Veprintsev spends eight or 10 weeks in the field with his friend and colleague Vladimir V. Leonovitch. Over 12 years these two have visited many parts of the USSR. In 1985 they were in the mountains of the Caucasus, where they captured on tape the song of Radde's Accentor *Prunella ocularis*, a tiny bird of the Alpine zone. It was new to the collection. In 1983 they had an extraordinary stroke of good fortune. On Sakalin Island they taped the distinctive song of a kind of leaf-warbler previously unknown to science! Looking as it did, it should have been a Pale-legged Willow Warbler *Phylloscopus tenellipes* but its voice totally gave it away. And when some were trapped and examined in the hand, they were found to have small but significant differences in the shapes of their primary feathers. The bird has been dubbed *Phylloscopus borealoides* in Latin, but awaits its Russian (and English) name. Its voice will appear in the aforementioned Great Soviet Encyclopaedia of Bird Songs (actually called 'The Birds of the USSR: a Sound Guide').

By the year 2000, the work will be complete: 750 birds' songs on 25 LPs. That will be 100 hours of playing time for the scientists and bird buffs (and more than enough, surely, to push up the Soviet divorce rate?). The work's closest western competitor has only 15 LPs. To his eternal credit, Boris Veprintsev got the first three discs on to the market in August 1982, in time for the XVIIIth International Ornithological Congress in Moscow. Visiting ornithologists from the USA and elsewhere snapped up the records (at only a pound a piece) and were able for the first time to hear the voices of certain Soviet specialities, birds that breed in the USSR and nowhere else, like the Spoon-billed Sandpiper *Eurynorhynchus pygmeus*, a delightful little wading bird of the Siberian Arctic that performs a song flight, rising high into the air and uttering a rhythmic buzzing sound, and the Red-necked Stint *Calidris ruficollis*, another shore bird that hangs in the air like a Skylark *Alauda arvensis*, for 10 minutes or more pouring forth a trilling love song. Then there is the voice of the Little Curlew *Numenius minutus*, the Asiatic ecological counterpart of America's near-extinct Eskimo Curlew *N. borealis*. The Little Curlew was the special object of an expedition to remotest Yakutia (east-central Siberia) by Veprintsev and Leonovitch. The bird was little known and so special efforts were made to study its ecology and behaviour and to bring home colour photographs and 16mm colour film, as well as tapes of the bird's vocabulary. The scientific account was translated into English and

carried in a prestigious western journal, the *Ibis*. Amazingly this bird was found to create sounds not only vocally but also by using its body as an instrument. The male Little Curlew dives through the sky and mechanically creates an impressive sound strongly reminiscent of a jet plane's whine. A careful examination by me of skins of the species in the American Museum of Natural History showed no specially shaped feathers, so whether the bird makes the sounds with wings or tail is still unknown.

The Little Curlew appears on the sleeve of its disc as perhaps the most prized capture on that particular record. The next two discs to appear have buntings and larks respectively. They were issued in time for the exhibition of Soviet animal voice discs arranged by Igor D. Nikolsky at Moscow's K.A. Timiriazev Biological Museum in December 1986, celebrating 75 years of Soviet animal voice publication.

It was not, of course, necessary to wait for mechanical means of reproducing animal sounds. Man has created, no doubt for thousands of years, vocal impressions of birds and with primitive instruments like whistles. Soviet goose hunters try to lure within range the Greylag Goose *Anser anser* by vocally reproducing its call. In Moscow sportsman's shops, alongside guns and ammunition, special clothing and heavy boots, are displayed three-dimensional wooden decoy ducks and plastic decoy duck whistles. I have bought well-made metal 'bird-calls' in Moscow for luring the Hazel Grouse *Bonasa bonasia* into the open and thus into the gunsight. At a much earlier stage, when birth was being given to human spoken languages, the copying - mimicry - of the sounds of animals gave these animals their names and hence the language new words. This has been studied by the Soviet zoo-linguist, Olga Silajewa. Obvious examples are the Russian words for Cuckoo *Cuculus canorus*, 'kukushka', for Peewit (Lapwing), 'cheebiss', for Wigeon *Anas penelope*, 'sveeyaz', for Quail *Coturnix coturnix*, 'perepel',

But it was with the advent of mechanical recording, first on disc and more recently and effectively on tape, that enormous strides have been made in putting these means of reproducing animal sounds to scientific, economic and aesthetic use. Now the toast can only be: 'The future of Soviet bioacoustics in the service of man, coupled with the name of Boris N. Veprintsev'. Boris has recently been made the first honorary member of the West's Wildlife Sound Recording Society.

(The author is singularly grateful to Michael G. Wilson upon whose translations from the Russian this article is partly based. Further, Mr. Wilson checked the science and syntax of earlier drafts, thus greatly improving what appears above.)

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THE PRESIDENT'S GARDEN PARTY

Sunday, 4th June, 1989

By JEFFREY TROLLOPE

(Hounslow, Middlesex)

Over 100 members and their guests gathered at Chestnut Lodge, Cobham, Surrey, at the kind invitation of Miss Ruth Ezra and Mr. Raymond Sawyer, President and Vice-President of the Avicultural Society. Apart from a brief shower, the weather was kind and the gardens and hospitality superb.

As always, change and innovation were in progress, additional aviaries were being constructed and species new to the gardens were on view. The collection is displayed in aviaries and tropical houses, which would be envied by many zoos and bird gardens.

Although comparatively early in the season, some interesting and unusual breeding results had been achieved. Annual success with Keas had been repeated, with three young reared. Plumbeous Redstarts had bred for a second season, with five young independent. A probable first British breeding has been achieved with Tit-babblers, and Green Wood Hoopoes have also bred. Azure-winged Magpies, Red-tailed Minlas, Royal, Emerald and Splendid Starlings all had chicks in the nest.

Species incubating included Golden-heart Doves, Golden-breasted Mynahs, Red-tailed Laughing Thrushes, Raquet-tailed Treepies, Avocets and Ringed Plovers. Among the waterfowl collection, Hooded Mergansers had reared young, and Orinoco Geese, which had bred the previous season, were incubating. Among the birds much admired by the visitors were Scarlet Ibis, Long-tailed Broadbills, White-collared Bee-eaters, Banded and Blue-winged Pittas. Other species, too numerous to list, ensured that there was something for every avicultural taste and interest, from humming birds to Crowned Cranes.

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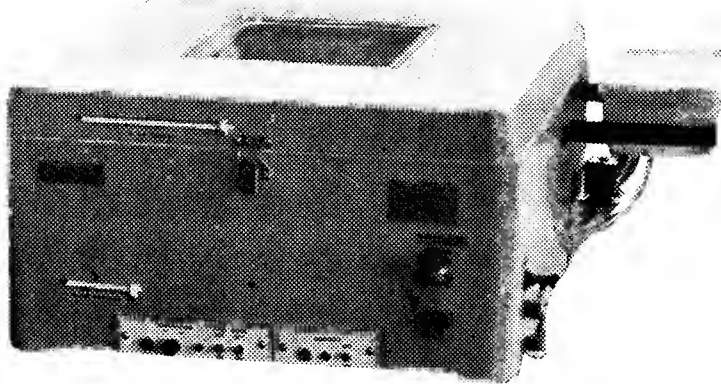
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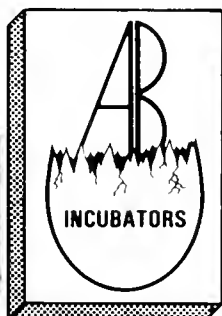


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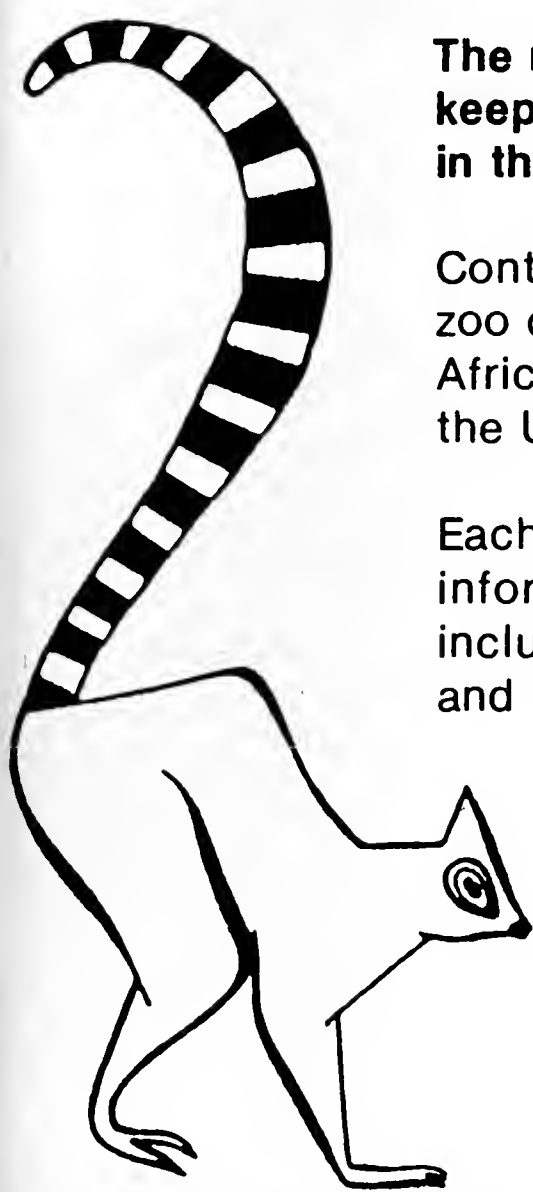
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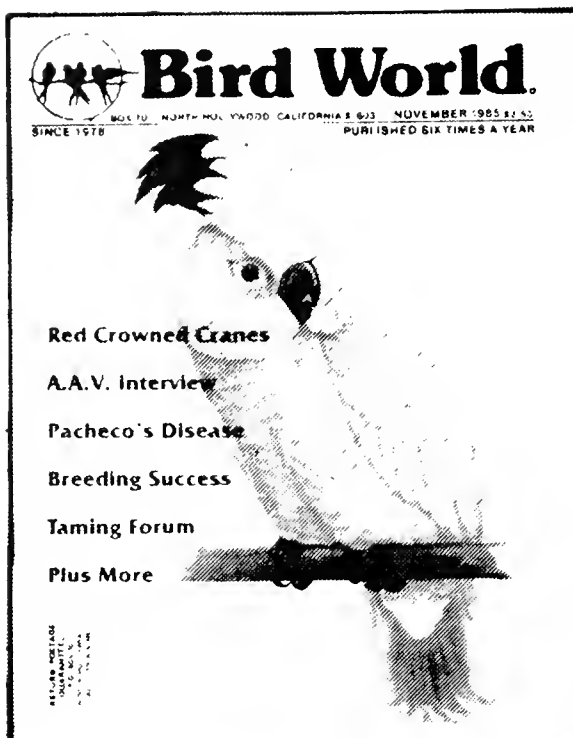
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R. Garrison, Zoological Society of San Diego
Andean Cock of the Rock, one day old, hand-reared at San Diego Zoo, 1988

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ARTIFICIAL INCUBATION AND HAND-REARING OF AN ANDEAN COCK OF THE ROCK

(*Rupicola peruviana*)

By AMY KENDALL and CYNTHIA KUEHLER
(Zoological Society of San Diego)

Introduction

Few species are rivalled by the unique beauty of the Andean Cock of the Rock *Rupicola peruviana*. These birds are found in western Venezuela, through the Andes to Ecuador and Peru, as well as in Bolivia (Meyer de Schauensee, 1964). The tropical and subtropical zones are where these elusive birds are found, and most of their courtship activities are performed in the middle and lower forest canopies (Snow, 1982).

Andean Cocks of the Rock are protected as a “species of concern” in Colombia. Although they are not recognised as an endangered species by CITES (Convention for International Trade in Endangered Species) they are not commonly observed in their range. Their behavioural and physiological requirements are such that only a narrow ecological niche within that range can support this species (Lieberman, pers. comm.).

Six zoological institutions currently have these extraordinary birds in their collections: Zoological Society of San Diego, National Zoological Park, National Aquarium, Philadelphia Zoological Gardens, Dallas Zoological Park and the Mendellin Zoological Park (ISIS, 1988). Two have bred them successfully and reared chicks; the Houston Zoological Gardens starting in 1979 (Berry, 1982) and the Zoological Society of San Diego in 1988.

Adult management

The Zoological Society of San Diego maintains 3.4 individuals in the collection. The breeding group is housed in what is known as the Scripps Aviary, a large planted mixed species walk-through aviary

(60' × 200'). Lek displays are observed in the summer months, usually between 3.00 pm and 6.00 pm.

The adult diet consists of anoles *Anolis carolinensis*, grapes, blueberries, soaked dog kibble, Zupreem Bird of Prey Diet, papaya, bananas, apples and Blair's Superpreen as a vitamin supplement. Roxanthin is also added daily in order to enrich the brilliant orange plumage.

Artificial incubation

On 16th June, 1988 a single, oblong, white egg was discovered in a mud nest constructed of dried grass, maidenhair fern and saliva. The nest was located in a "cave" which serves as a keeper access and supply area within the aviary. This cave in some ways mimics the natural nesting areas known for this species; rocky areas found in the gorges between mountain streams. An adequate supply of mud for nesting was supplied on a continuing basis in several different areas in the aviary.

The lone egg was immediately pulled for artificial incubation due to the risk of egg predation by other bird species in the aviary. Candling revealed the egg to be fertile and it was placed in a Petersime incubator, with the dry bulb temperature set at 99°F and the wet bulb temperature between 86° – 88°F. On 4th July, after 25 days' incubation the chick pipped. After 72 hours in the hatcher, (98.5°F – dry bulb, 88° – wet bulb) the chick had made little progress and the decision was made to help the chick out of its shell, in order to prevent fatigue or even death. On 7th July, 1988, the San Diego Zoo hatched its first Cock of the Rock.

Hand-rearing protocol

Having never reared a Cock of the Rock at the Zoo's Avian Propagation Center, excitement and concern mounted over the task to be accomplished. In the quest for information, it was discovered that few breeding notes exist in published form. The Houston Zoological Gardens had successfully reared Cock of the Rock chicks which had been removed from the nest after a few weeks of parental care (Berry, 1982; Plasse, pers. comm.). Having generously shared their information and experiences, it was possible to extrapolate a successful hand-rearing diet for a one-day-old chick. The initial diet fed to the chick was as follows:

Cat Chow Mixture

17g water

3g ground Purina cat chow

3g fruit sauce

(50:50 by weight, pureed papaya and Gerbers' Junior apple sauce)

Approximate % Protein (Dry Matter Basis) = 30%

Approximate % Fat (Dry Matter Basis) = 8%

% Solids in Mixture = 13%

(Analysis – Animal Nutritionist Software)

New food items were gradually introduced by offering one new item daily, until a variety of foods were in the diet. The purpose of adding new diet items in this manner was to allow close observation of the birds' behavioural and physiological reaction to each new food. The full diet which was ultimately offered to the Cock of the Rock chick was: Zebra finch breast meat, chicken white meat, papaya, banana, avocado, soaked Purina cat chow, soaked fig pulp, crickets, blueberries and beef heart meat. This mixture was fed chunky and very wet after being soaked in either lactated ringers solution or Nekton Lory mix. Blair's Superpreen was used as a vitamin supplement. The hand-rearing protocol was as follows:

- Day 1 – 2: Cat chow mixture every hour.
- Day 3: Cat chow mixture every 2 hours. Two feedings of soaked cat chow and papaya introduced.
- Day 4: Cat chow mixture alternated with papaya and soaked cat chow chunks, every 2 hours.
- Day 5 – 6: One feeding of cat chow mixture. Papaya and cat chow chunks every 2 hours.
- Day 7 – 30: Chunks only every 2 hours, 1 new food item added daily.
- Day 31 – 40: Chunks every 3 hours with free choice available.
- Day 41 – wean: Chunks 3 times daily with free choice available.

It is important to note that all feedings were completed within a 12 hour period, starting at 7.00 am.

For the first 20 days of life, the chick was housed in an aquarium brooder. A standard ten gallon aquarium was equipped with a thermostatically controlled coil heating unit (Lyons – #BHA 1081). Initially the chick was brooded at 95°F. The temperature was decreased gradually as the bird grew and was adjusted depending upon the chick's comfort. At day 21 the Cock of the Rock was moved into a 2' × 2' × 1.5' box brooder thermostatically controlled with a wafer thermostat. The chick pinned and feathered out in this

environment, after which it was transferred to a small cage 2' \times 1.5' \times 1.5'. Initially, infra red heat lamps were used for heat, until the chick was able to be maintained at ambient room temperature approximately 75°F.

The weaning cage, with the door open, was eventually placed in an outdoor aviary, so that the chick could gradually explore its environment as well as its wings and flying abilities. The bird was brought inside the brooder room each evening for safe keeping until day 70, when it was felt the chick was fully weaned and ready for the world.

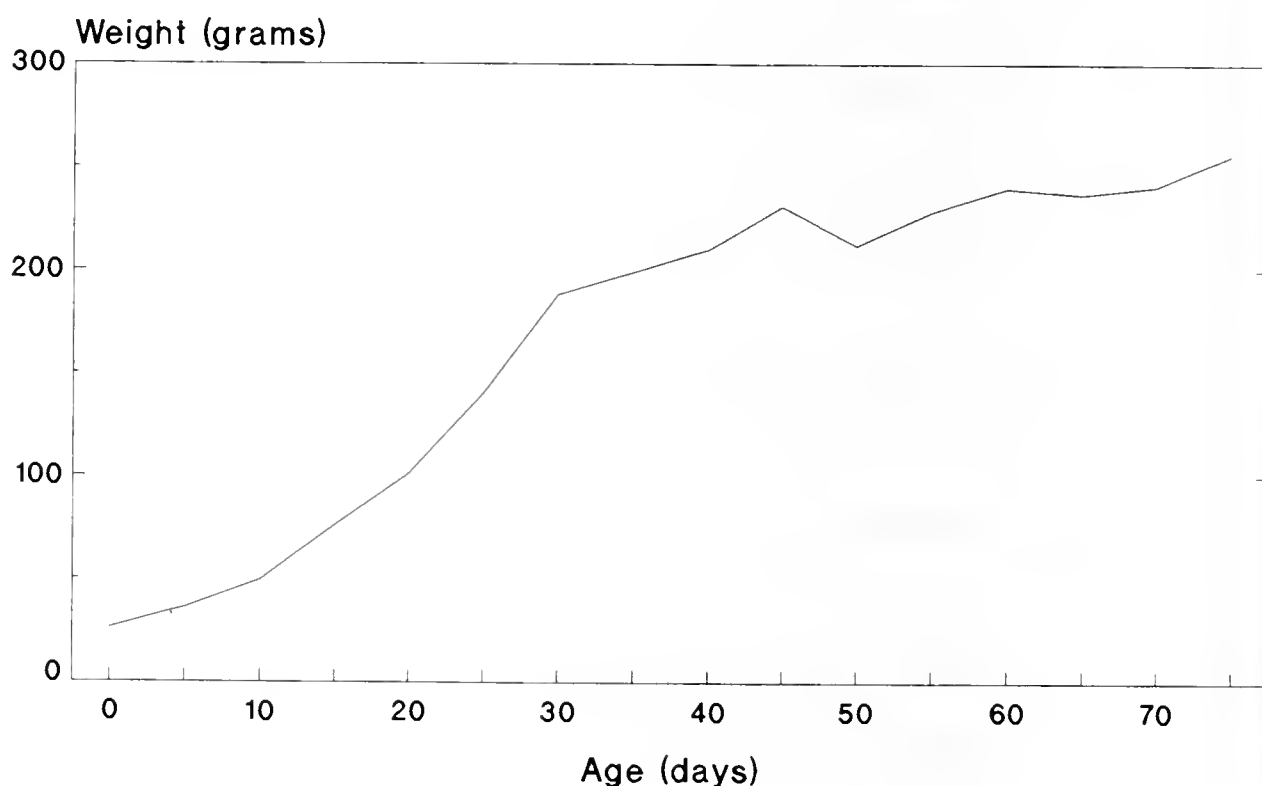


Table 1: Growth curve of Hand-reared *Rupicola peruviana*, Zoological Society of San Diego, 1988.

Comments and problems

Fortunately, there were few developmental or medical problems while rearing the Cock of the Rock. Artificial incubation parameters will be changed in the future by lowering the incubation humidity. This should enable future chicks to hatch out on their own.

On day 6, a small superficial pimple about the size of a pinhead appeared on the chick's rump. The pimple was expressed and cultured. The culture results indicated a heterophyll inflammation associated with gram positive coccus. There was no indication of a systemic problem, as the bird appeared normal in all other respects. Day 15, however, presented an additional pimple, this time on the chick's pygostyle. The area was cleansed twice daily with Betadine, for five days after the pimple was expressed. There were no further

skin problems during the chick's development.

Development continued in a normal fashion until day 49 when, despite the offering of a tight, shallow nest with sticks, to keep the legs underneath the bird's body and the toes gripping, the chick's toes began to curl inward. Unfortunately in order to determine the existence of crooked versus curled toe syndrome, histological examination of the sciatic nerves is the diagnostic technique. Curled toes can be caused by riboflavin deficiency or incorrect incubation temperature. Crooked toes can be a genetic tendency aggravated by substrate, inbreeding and infra-red brooding (Abbott, 1973a; Beer, 1969; Peckham, (1972); NACS, 1977).

In order to improve the toe problem, the infra-red heat lamp was removed as a heat source for this chick and additional B-vitamins were added to the diet. After these steps were implemented, the rate of foot degeneration slowed down and the development of a potentially chronic problem was curtailed.

PRODUCTS MENTIONED IN THE TEXT

Blair's Superpreen, 1640 East Edinger Ave., Santa Ana, CA 92705

Lyon brooder, Lyon Electrical Company, 2765 Main Street, Chula Vista, CA 92011

Petersime Incubator, Petersime Incubator Company, 300 North Bridge Street, Gettysburg, Ohio 45328

Zupreem Bird of Prey Diet, Animal Spectrum, P.O. Box 6307, Lincoln, Nebraska 68506

Purina Cat Chow, Ralston Purina Co., St. Louis, Missouri 63164

Gerber's Applesauce, Gerber Products Co., Fremont, MI 49412

ACKNOWLEDGEMENTS

The authors would like to acknowledge the following individuals, without whose dedicated involvement the success of this breeding would not have been possible: Robert Chapman, Jackie Good, LoRayne Haye and Barbara McIlraith.

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* * *

BREEDING THE OCELLATED TURKEY IN NORTH GERMANY

Agriocharis ocellata (Cuvier 1820)

By RICHARD PERRON
(Varel, West Germany)

Although some taxonomic authorities continue to classify the Ocellated turkey under *Meleagris*, after Linné 1758, it is generally recognised today as a separate branch of the turkey family and classified, after Chapman 1896, under *Agriocharis*. This very colourful and inquisitive bird is to be found in the neotropical region of SE Mexico, Guatemala and Belize. Native hunting in the area has recently raised fears about the status of the Ocellated turkey in the wild and consideration is being given to its future protection level under CITES. (Convention on International Trade in Endangered Species).

The Ocellated turkey was first seen in England in 1848. Later the London Zoo acquired three, a present from Honduras for Queen Victoria in 1857, but had no success in breeding. Although several attempts were made in the following century, it was not until 1940 in Leckford Aviaries that success was achieved from birds raised by the hunter Cordier in Central America. Today, most of the specimens in captivity can trace their ancestry back to the San Diego Zoo which pioneered artificial insemination to aid propagation in the late 1940s.

On 24th August 1988, I received a pair of one-year-old, captive-bred, Ocellated turkeys from Frankfurt Zoo and placed them, with

some trepidation knowing their reputation, in an outdoor aviary already containing a pair of adult green peafowl, *Pavo muticus imperator*. The 330 sq metre enclosure is 2.2m high, covered in UV resistant 50mm mesh netting and left to grow wild. Each end of the 10 × 33m cage has its own heated hut with perches and automatic drinkers.

Despite my fears, the Ocellated turkeys acclimatised quickly to their new environment and there was no evidence of inter-species aggression. The small food intake of the new arrivals proved to be quite normal and, although they were partial to the occasional titbit of apple, tomato or mealworms, they also ate the standard grain mixture I use for my peafowl and pheasants, as well as the on-site plant and insect life. As so often with captive-bred species, the male was quite tame and would feed from my hand, giving me some (unnecessary) concern about his breeding suitability. The female, in contrast, was rather shy and would not let me come too close. Apart from a few traumatic moments when finding clumps of tail feathers beneath the outside perches in the late autumn, due probably to a local polecat or marten, and the occasional midnight foray on frosty nights to shepherd the unwilling birds into a warm hut, time passed uneventfully into 1989.

We had a very mild winter and by the second week in April the male was already beginning to display before an apparently indifferent female. The first week in May was very hot and the cock's display behaviour reached fever pitch, being directed at anything that came within range, but still no sign of interest on the part of the female. I had reconciled myself to disappointment when the first egg was laid on 7th May under a low windbreak in one corner of the enclosure where the birds had often spent the night. The 60cm × 46cm oval eggs, cream with chocolate spot markings, were laid daily until 14th May in a bare minimum of a nest. I removed five eggs in total, leaving the hen with three to hatch on her own.

In a way, breeders are prisoners of their love for their birds and I always find it difficult to remove all the eggs from a nest, despite many unhappy results, feeling that nature should have its chance of fulfilment. As it was, the hen sat well for three weeks and then lost two eggs in quick succession to a marauding hedgehog. The disturbance, which took place at night, unsettled the bird so much that the embryo died in the third egg.

Through my own clumsy handling, the eggs for artificial incubation were reduced to four and on setting at 19.00 hours on 15th May weighed 62, 64, 66 and 68g respectively. The Schumacher Vomo 0

Maxi incubator, with an automatic hourly push/pull turning device, was set between 37.4°C and 37.8°C with a hair hygrometer measured humidity of 60%. On the 25th day, the eggs were removed and placed in an identical machine without turning facilities, where the temperature was reduced to between 37.2°C and 37.6°C with an increased humidity of 75%. The floor of the hatcher was furnished with a piece of pile carpet to give the chicks maximum traction and avoid splayed legs. Shell picking commenced at 11.30 on 27th day and the first chick hatched at 17.33 later that afternoon. The next hatched at 21.14 and the last two during the night into the 28th day. Weights recorded at 13.00 on 12th June were 42, 42, 42 and 46g and the average shell weight was 4.75g.

All of the chicks appeared healthy and were removed to a rearing box with an infra-red heating bulb, giving a "nest" temperature of 30°C, on the morning of the 29th day. Although the practice is widespread, I did not feel it necessary to use any disinfectant on the umbilical cord scar. Water, containing a calcium additive, and turkey chick pellets were placed in the box.

Because I had read the literature, I was expecting severe feeding problems and had specially acquired an assortment of mealworms, maggots and grasshoppers which were also placed in with the turkey pellets. Initially the chicks showed little interest in the food and had only increased their average weight by 1.5g by hatchday plus two. This was thankfully temporary and a rapid growth pattern soon became evident thereafter; the hatch weight being doubled by the ninth and trebled by the 14th day. The insect food was certainly appreciated by the chicks, but they continued to feed quite happily on the pellets and displayed no adverse reaction when the live food was discontinued after a few days. Because of the extremely warm weather, the chicks were placed in an outside rearing cage at three weeks and the temperature of their shelter hut steadily reduced from 28°C by 1°C every two days until it reached 16°C, equalling our night-time low.

The chicks were able to flutter by the sixth day and could fly by the tenth, being increasingly difficult to weigh. The only observable problem was with the toes of two birds where some were slightly twisted and bent outwards: toe splints have improved, but not cured the problem. There was always an observable size disparity, between the young birds, after the first few days, indicating a probable sexual difference, although confirmation of this had to wait until physical characteristics were more pronounced. At seven weeks I commenced the ringing, using a 20mm inside diameter sealed band, and it proved

possible to identify the largest bird as a male due to the knob-like protrusion in the middle of his forehead. At that stage the chicks were moulting and had already assumed the unmistakable colouring of their species.

At ten weeks all the chicks were moved into the pen containing the parents. Initially the mother showed signs of aggression towards the new arrivals, probably to defend her own hierarchical position, and pecked each of them repeatedly about the head, although not drawing blood. Within a few hours this problem appeared to have resolved itself, the "pecking order" having been established, and the family settled down to what seems to be a harmonious co-existence.

* * *

HUSBANDRY AND CAPTIVE BREEDING OF FAIRY BLUEBIRDS (*Irena puella*)

By ANN SILVERI

(Curator of Birds, Toledo Zoological Gardens, Toledo, Ohio)

and

BRUCE BOHMKE

(Curator of Birds, St. Louis Zoological Park, St. Louis, Missouri)

SUMMARY

A survey on the husbandry and captive breeding of Fairy Bluebirds *Irena puella* was distributed to 37 North American zoos in order to compile information on captive management of this species. Twenty-eight institutions housing the birds responded.

Aviary sizes vary widely, but size does not appear to be correlated with breeding success. Most Fairy Bluebirds are housed with other species of birds. This species has used a variety of artificial nest structures, and has also built natural nests. Photoperiod has a noticeable effect on the timing of reproduction. Birds exposed to a natural temperate-zone photoperiod laid between April and August, while birds exposed to artificially lengthened days for part of the year laid eggs from April through October. Diets are similar at all zoos. All adults able to rear their own offspring were supplied with live

insects, though it is not certain what portion of the chicks' diets were composed of these. Fertility of eggs was high, (88%) and incubating birds were able to hatch 94% of their fertile eggs.

Parents fledged 34% of their offspring, while hand-rearing yielded a 21% fledge rate. Possible reasons for poor rearing success are discussed.

The demographics revealed by this survey indicate that *Irena puella* is a good candidate for a captive management plan. It would be relatively easy to manage the captive population in such a way as to minimise needed infusions of wild-caught birds.

Introduction

The Fairy Bluebird *Irena puella* is a common species, widely distributed throughout India and Southeast Asia. At least six geographically isolated subspecies have been described. (Howard and Moore, 1980). A popular exhibit and common in zoos, the Fairy Bluebird is still an unreliable breeder in captivity. This survey represents an attempt to compile information on husbandry and elucidate problems associated with captive breeding.

Materials and methods

A survey on Fairy Bluebird husbandry and captive breeding was distributed in September, 1987, to 37 North American zoos reported to hold Fairy Bluebirds. Twenty-eight institutions housing the birds responded, and the results were summarised. Husbandry and breeding data from three institutions were incomplete, and had to be excluded from calculations of fertility, hatchability, and survivability.

RESULTS

Demographics

Fifty-four male, forty-nine female, and five unknown sex living birds were recorded for a total of 108 birds. Eighty-two of these birds (76%) are wild-caught, twenty-one are captive-hatched, and five are of unknown origin.

Fairy Bluebirds were reported to live as long as eleven years in captivity, and to produce young as late as their tenth year. The ISIS SDR Abstract for December, 1987 also shows the oldest captive Fairy Bluebirds to be eleven years old, and the average age of the 94 birds to be 4.9 years.

Diet

All institutions feed their birds a fruit mix in combination with a

high-protein insect substitute such as softbill mix, soaked dogfood, or birds-of-prey diet. Several institutions add vegetables to their fruit mix, and one (successful in breeding Fairy Bluebirds) substituted a canned fruit mix for fresh fruit.

Fifteen of the 28 institutions feed live insects, including all eight zoos which were successful in producing parent-reared offspring. It was not clear, however, what proportions of the chicks' diets were composed of insects. Fourteen institutions use a vitamin and/or mineral supplement, but use of this item does not appear to be correlated with breeding success. Only five of the 11 institutions which successfully reared Fairy Bluebirds reported using such a supplement.

Housing

Aviary size varies from 32 sq.ft. (2.97 sq.m) for an off-exhibit propagation area to 1½ acres (6050 sq.m) acres for an outdoor mixed-species flight. Height varies from 7 to 65 feet (2.13 to 20m). Breeding success does not appear to be correlated with aviary size, although it is possible that birds in smaller aviaries tend to have better success raising their young (Table 1). Chicks have been parent-reared in aviaries from 32 to 2511 square feet (2.97 to 233.27 sq.m), and eggs were laid in both the largest and smallest aviaries recorded in the survey.

Most Fairy Bluebirds are housed with other species of birds. In three cases, pairs were able to rear young in the presence of other species. Pekin Robins and Hooded Pittas were mentioned as exhibit-mates in one such situation. In two institutions, Fairy Bluebirds are housed with reptiles and mammals. One pair of birds in such a situation laid eggs, although no young were reared.

One zoo houses its Fairy Bluebird pairs in isolation in an off-exhibit propagation area. Two pairs have been productive layers of fertile eggs in such a situation, but have reared young from only four of 43 eggs laid.

Breeding

Eleven institutions reported successful rearing of Fairy Bluebirds. Five produced at least one parent-reared chick; the remaining six employed hand-rearing or a combination of the two approaches.

Of the institutions which did not rear Fairy Bluebirds, nine reported some form of breeding behaviour such as egg-laying, copulation, or nestbuilding. The remaining eight institutions reported no breeding activity at all. The majority of birds at these institutions

had been in captivity for less than two years, in contrast to the successful breeding birds, most of which had been in captivity for three to ten years.

Photoperiod and Timing of Reproduction

Photoperiods experienced by captive Fairy Bluebirds differ considerably from institution to institution. In general, reported photoperiod types could be divided into the following categories:

(1) *Natural temperate-zone photoperiod* The birds are exposed to only natural light, or, if artificial supplementation is used, it is on *only* during daylight hours.

(2) *Days artificially lengthened for part of the year* The birds are exposed to natural light, but artificial supplements extend day length for part of the year (either in the fall and winter or the spring and summer).

(3) *Single fixed artificial photoperiod throughout year* The birds receive artificial light only. "Day" length is the same throughout the year.

(4) *Two fixed artificial photoperiods* As above, but a longer artificial day is used in the spring and summer.

Table 2 gives a summary of photoperiod information as it corresponds to egg-laying. Because of the small sample size it is difficult to say which regimen, if any, is the most successful at stimulating reproductive activity.

When a natural temperate photoperiod was supplied, the birds always laid between April and August. Artificial lengthening of days for part of the year, appeared to lengthen the laying season. Institutions providing longer than natural day lengths in the fall and winter *or* in the spring and summer received eggs in April through October. The one institution using a fixed artificial photoperiod throughout the year received eggs in July and November, indicating perhaps, that its birds were laying without seasonality.

Twenty-one institutions reported their birds as building and/or using nests. Types of nest structures are given in Table 3, and locations, where reported, are given in Table 4. Birds which did not nest on the ground chose locations from 6 to 15 feet (1.83 to 4.57m) above the ground. When the Fairy Bluebirds built a nest unaided, twigs, grasses, leaves, and pine needles were the materials reportedly used.

Summary of Eggs and Chicks

Table 5 gives calculations of Fairy Bluebird egg fertility, hatch rate

and chick survival rate. Nineteen percent of the eggs laid were lost due to breakage, predation, disappearance, or nest abandonment. Fertility, determined for 108 eggs was 88%. Parent-incubated eggs showed a 94% hatchability, and machine-incubated eggs, 50% hatchability. Fairy Bluebird pairs fledged 34% of the young they hatched, while hand-rearing yielded a 21% fledge rate.

Founder Contribution

Fifty-five percent of the wild-caught Fairy Bluebirds recorded by this survey have produced offspring. An additional 29% have laid eggs but fledged no chicks. Six captive-hatched birds have produced offspring. Since none of these bred until their second year, it appears that Fairy Bluebirds may require two years to reach sexual maturity.

DISCUSSION

Though many breedings have been recorded, Fairy Bluebirds are still unreliable producers in captivity. As this survey demonstrates, they will nest under a wide variety of conditions. The majority of problems occur during incubation and rearing.

Parent-incubated eggs show a high hatchrate, but the same is not true for machine-incubated eggs. Though many institutions had difficulty hatching artificially-incubated eggs, one institution obtained a 100% success rate with seven eggs incubated at a temperature of 100.5°F, 86°F wet bulb. Thus, it appears that Fairy Bluebird eggs may require incubation temperatures slightly higher than the eggs of other species.

Chick-rearing also presents considerable difficulties, as the low fledging rates show. Since most Fairy Bluebirds are housed in mixed-species exhibits, it is easy to blame rearing problems on interference from other birds. One zoo did report chicks disappearing in a mixed-species exhibit. However, two pairs of birds kept off-exhibit in isolation at another zoo also had low-rearing success, rearing only four chicks out of the 18 hatched. A third zoo has seen a male Fairy Bluebird killing his offspring, and now places this bird in a separate cage a few days prior to hatching. It would appear prudent for zoos to monitor the behaviour of their male birds during incubation and chick-rearing, separating them if problems appear.

Lack of adequate nestling food, both for parent-reared and hand-reared offspring may be a problem. Parent-reared birds may be fed a high proportion of live insects. Commercially-produced crickets have been shown to be deficient in calcium (Fowler, 1986). It is possible that the few commercially-available varieties of live insects

provide a poor diet for growing chicks. The calcium deficiency, at least, could be remedied by feeding the insects a high-calcium diet or providing insect species, such as fly larvae, with a higher calcium/phosphorus ratio. It is perhaps significant that the one successful hand-rearing diet reported in the survey was based on newly born mice rather than insects.

Several researchers have raised a variety of insectivorous and frugivorous passerines on a syringe-fed diet with multiple ingredients (Lanyon, 1979; Mathison, 1988). Perhaps such an approach would be successful in hand-rearing Fairy Bluebirds.

Experimentation with artificial incubation and hand-rearing can be extremely time-consuming. Since Fairy Bluebirds use photoperiod length to time their reproduction, it may be possible for zoos using artificial photoperiods to encourage their birds to breed during the winter, thus allowing more time for experimental manipulation.

Fairy Bluebirds are good candidates for a captive management plan such as a studbook. They are popular exhibit birds, long-lived in captivity for a small passerine, and their zoo population contains a high proportion of founders. They are still common in the wild, and therefore not in need of conservation-directed management. However, with some population management and improvement of rearing techniques, it appears that a genetically balanced captive population could be maintained with minimal infusions of wild-caught birds.

CONCLUSIONS

- (1) Captive Fairy Bluebirds will attempt to breed under widely varying conditions of housing, photoperiod, and available nest-sites.
- (2) For parent-incubated eggs, fertility and hatchrate is high. However, the fledgling rate is relatively low for both parent-reared and hand-reared chicks.
- (3) This species is common in zoos, and long-lived for a small passerine. The captive population contains a high proportion of founders. These characteristics make the Fairy Bluebird a good candidate for a captive management plan such as a studbook.

TABLE 1
BREEDING OF FAIRY BLUEBIRDS IN DIFFERENT AVIARY SIZES

Aviary Floor Dimensions (Square feet)	Number of Institutions Reporting*	Number of Institutions Reporting Any Breeding Activity	Number of Institutions Reporting Parent-reared Young**
22-100	4	3	3
100-1000	10	7	1
1000-5000	5	3	1
over 5000	4	3	1

* Not all institutions reported aviary size

** One institution reported parent-reared young produced from 2 different aviary sizes

TABLE 2
PHOTOPERIODS TO WHICH CAPTIVE FAIRY BLUEBIRDS
ARE EXPOSED

Type of Photoperiod	Times Reported	Times Egg-Laying Reported with This Photoperiod	Months of Egg-Laying
Natural temperate zone photoperiod	17	6	April, May June, July August
Days artificially lengthened in spring & summer	2	2	April, May June, July October
Days artificially lengthened in fall & winter	5	2	April, May June, July August, October
Fixed photoperiod	1	1	July, November
2 fixed photoperiods longer in spring and summer	1	0	None

TABLE 3
NEST STRUCTURES USED BY CAPTIVE FAIRY BLUEBIRDS

Nest Structure	Number of Times Reported
Structure built unaided	5
Artificial structures	
Woven baskets	5
Open-sided or open topped box	4
Wire platform	4
Top of closed box	1

TABLE 4
LOCATIONS OF CAPTIVE FAIRY BLUEBIRD NESTS

Location	Number of times reported
Ground	1
Plant	3
Ledge or hole in wall	5
Shelf hung from wall	2

TABLE 5
FAIRY BLUEBIRD EGG FERTILITY HATCHRATE
AND CHICK SURVIVAL RATE

Number of eggs laid	211
Fate not reported	30% (64/211)
Lost before or during incubation	19% (39/211)
Incubated full term	51% (108/211)
<i>Fates of Eggs Incubated Full-Term</i>	
Eggs which were fertile	88% (95/108)
Machine-incubated,	
fertile eggs which hatched	50% (7/14)
Parent incubated, fertile eggs	
which hatched	94% (76/81)
Hand-reared chicks which fledged	21% (3/14)
Parent-reared chicks which fledged	34% (26/76)

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HAND-REARING THE LESSER VASA PARROT

Coracopsis nigra

By ROSEMARY LOW
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The genus *Coracopsis* contains two species, the Lesser Vasa *C. nigra* and the Greater Vasa *C. vasa*. They are the least typical and perhaps also the least admired of all parrots, because they are entirely dull grey. Only those who admire parrots for their personality or who are intrigued by their behaviour will appreciate the Vasas. For me they hold a fascination which is equalled by a few but not surpassed by any other genus.

Vasas were almost unknown in captivity until the early 1980s. The Lesser has been bred in captivity in four or five collections (at Chester Zoo in Britain and in private collections in Germany and Switzerland). I do not know of any published report of the breeding of the Greater Vasa and would be most interested to hear from anyone who has succeeded.

Vasas, more than any parrots I know, are sun-worshippers. They assume exaggerated postures, usually with one wing outstretched and the tail fanned to one side, to soak up the sun. The climate of Tenerife, with its many hours of sunshine, suits them very well (me, too!). At Loro Parque, in a range of four large aviaries for African

species, is one enclosure containing four Lesser Vasas and, next to it, one for a pair of Greaters. Each aviary measures approximately 9ft wide \times 14ft deep \times 9ft high ($3 \times 4.2 \times 3$ m).

One egg was found in the nest of a pair of Lesser Vasas on 2nd July 1987 (I was then working at Loro Parque). The box was situated at a height of about 9ft (3m).

Three eggs were laid. Alas, on 15th July a female was found dead in the aviary. It happened to be my day off and I did not learn of her death until about midday, three hours after she was picked up. I immediately went to investigate the nest. I could feel but not see inside and removed two eggs before my fingers came into contact with the shell from which a chick had hatched. A keeper brought a ladder at once and reached inside the nest. He found a chick. It was stone cold – yet on its feet. The outside temperature was in the region of 80°F, 27°C. I placed the chick in an incubator which was operating at 96°F, 35.5°C. I afterwards realised I should have placed it in a brooder at a lower temperature. When I removed it to a brooder one hour later it was continually arching its head backwards; during the afternoon this behaviour gradually ceased.

The chick was amazingly strong. It was probably its second day of life; it had been pipping three days previously. Densely covered in longish white down, it was not a round fluffy ball, like a Grey Parrot *Psittacus* but stretched high, like a King *Alisterus* chick. The shape of its head and beak were also reminiscent of a King. There is not, of course, any relationship between the two genera; I mention *Alisterus* for comparison only.

Very little indeed had been recorded about the breeding biology of *Coracopsis* species, especially the development of the young but Becker (1987) mentioned the very short incubation and fledging period. This confirmed what Victorin Laboudallon told me of the Seychelles sub-species, the Black Parrot *C.n. barklyi* on Praslin Island in 1983. When I saw his record card for the only nest for which a fledging period had been recorded in the wild I felt he had made a mistake. Could a Vasa spend six weeks or less in the nest and could the incubation period be less than 18 days?

The answer is yes! I was unable to confirm the incubation period exactly as only one of the three eggs hatched and the eggs were not marked as laid. One egg was infertile and measured 35 x 29mm and in the other the embryo died about halfway through the incubation period. However, Becker had recorded an incubation period of only 13½ days and in our case, there were two eggs in the nest on 2nd July so possibly the first was laid on 28th June.



Lesser Vasa Parrot at Loro Parque Zoo

Rosemary Low

In view of the rapid development of *Coracopsis* chicks I judged that ours would need a diet containing at least 15% protein right from the start. Contents were as follows:

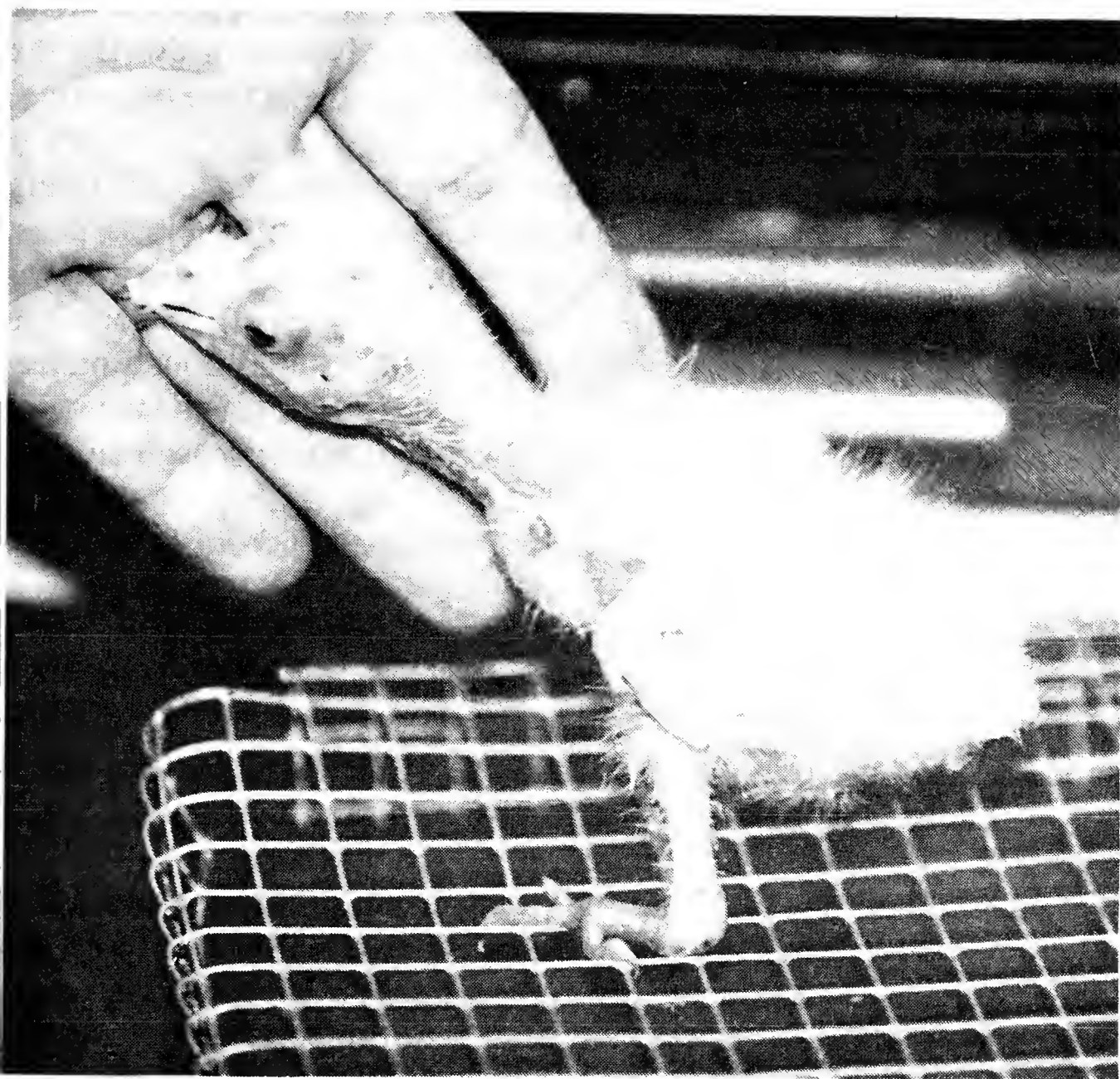
Parts	Approximate protein content %	Food
4	25	wheat germ cereal
2	16 or more	ground sunflower kernels
2	15	Milupa Mixed Vegetable
1	90	soya protein
1	about 6	banana
1	11	Canary rearing food

Assuming that the chick was two days old when taken, at five days its eyes started to slit. However, Becker stated that his chick's eyes were slitting at four days. Compare this with 15 or 21 days for most parrots.

The chick was fed every two hours between 6.30am and 10pm, plus a midnight and 4am feed until it was six days old. I then cut out the 4am feed. I was working long hours – also I found it difficult to get back to sleep again. Only very special chicks can induce me to leave my bed!

On its third day in the brooder I moved it from a surface of kitchen towel to welded mesh ($\frac{1}{4}$ in square) because it was bleeding from a small cut on the edge of the wing. This was almost certainly due to the bleach used in the paper towel. I have often encountered this problem which has ceased when chicks have been moved to welded mesh. This surface is also far superior for the development of their feet.

On 20th July I observed a phenomenon in this chick which I am reluctant to record, knowing that others will be sceptical – but it should be related for the benefit of anyone else who may be fortunate enough to rear this species. At 7am an organ was protruding about $\frac{1}{2}$ in (1.25cm) from the chick's cloaca. There was a little blood on the paper which lined the side of its container. I could not believe a prolapse had occurred because, a) I had never heard of this in a chick under one week old, and b) it did not look like a prolapsed organ. A couple of hours later the organ was partially retracted and by noon it was no longer apparent. The only explanation was that even a six day old *Coracopsis* has the ability to protrude its sexual organs. Never again did this occur. It should be pointed out that Vasa Parrots of both sexes have this ability, unique among parrots, when in breeding condition. I observed this many times in my own pair of Greaters and



Lesser Vasa Parrot aged 11 days

Rosemary Low

was very surprised at the large size of these organs.

After this incident the rearing of the Lesser Vasa never caused a moment's worry. By 23rd July its eyes and ears were open. By 27th July the white down was still profuse only on the lower back; the wings were darkening with the growing feathers under the skin. With its very long neck it was still reminiscent of an *Alisterus* chick. As well as the egg tooth on the upper mandible, it also had a V-shaped projection on the middle of the cutting edge. This can be seen in some of the photographs I took at the time. Its feet were then dark grey and the cere was as light as the beak. It had a thin, piping call and was extremely active, making photography difficult.

By 8th August the scapulars and the feathers of the crown were erupting. The egg tooth was still visible. By 21st August the young Vasa was fully feathered, except for the shorter tail. It was five weeks old and weighed 249g which was to be its adult weight! Then the beak

was still light; it began to darken from the base of the upper mandible and by the beginning of September was partly dark grey. By the middle of that month it was entirely dark grey. At the time of writing, March 1988, it is completely light.

On 20th August the young Vasa was seen eating a pea; it very quickly learned to feed itself. Green seemed to attract it as peas, mung beans and alselgar (a large-leaf spinach) were eaten first. It was extremely fond of alselgar, also peanuts in the shell. It soon ate almost everything in the normal food which included boiled maize, boiled peanut kernels, sunflower seed, gorbanza beans (not favoured), carrot, apple, orange and other fruits in season such as pear and cactus fruit.

On 20th August the young parrot was moved from brooder to cage. Almost silent previously, by the beginning of September it was becoming vocal, making squeaky sounds accompanied by jerky movements. It preened its breast feathers with quick little pecks like a pigeon; its plumage was wonderfully soft. Small dark hairs protruded around the eyes, nostrils and side of the head. At this age it was gentle except when new food was put in the cage when it would nip in its impatience to reach it.

It continued to take a little food from the spoon until the beginning of October but could be considered weaned about three weeks previously. Below are given the weights in grams of the young Vasa before and after the first feed in the morning. (Day 3 is assumed to be 16th July.)

Day 3	14.9/15.8	Day 19	88.9/93.1
4	16.5/17.1	20	96.3/103.4
5	17.0/17.9	21	102.1/107.5
6	19.2/20.0	22	110.1/115.8
7	19.4/20.0	23	120.8/126.7
8	20.4/21.6	24	127.2/132.7
9	23.1/24.1	25	134.2/141.3
10	26.5/28.0	26	142.1/148.8
11	31.6/33.5	27	149.7/172.6
12	36.3/38.0	28	159.3/171.2
13	43.5/46.3	29	169.6/179.6
14	51.7/46.3	30	172.9/184.9
15	57.6/60.2	31	181.8/192.6
16	68.8/71.4	32	187.2/197.8
17	74.1/76.8	33	197.7/209.6
18	85.0/89.1	34	201.3/228.1

Day 35	208.9/225.8	Day 55	245/-
36	218.5/229.8	56	243/257
37	228.5/243.8	57	246/251
38	238.3/254.3	58	245/256
39	249.4/266.1	59	244/253
40	258.7/278.1	60	241/248
41	254.5/285.3	61	241/242
42	261.1/285.4	62	237/248
43	165.7/289.8	69	234/246
44	263.9/281.1	76	248/260
45	265.4/282.3	83	247/253
46	269.3/285.8	90	246/-
47	268.9/280.9	98	244/-
48	263.2/279.9	104	243/253
49	260.2/274.7	111	253/260
50	257.7/268.5	118	254/-
51	255.2/264.8	125	259/267
52	253.1/265.3	132	258/-
52	253/263	159	249/-
53	253/261	166	248
54	247/257		

Rearing this Vasa was, for me, an absorbing experience. Probably the first of its species to be hand-reared, it gave me an insight into the development of this genus which reinforced my belief that *Coracopsis* may be a link between the parrots and the pigeons. I hope to have this confirmed or disputed before long. Dr Marc Valentine, the American cytogeneticist, responded to my request for information on the cytogenetics of *Coracopsis* with the promise to try to study the genus in the near future. To date, no one has sent him feather material for sexing purposes which could have enabled him to study the chromosomes. An interesting spin-off of Dr Valentine's work of sexing birds by preparing a culture from a blood feather, is comparative cytogenetics, used to interpret evolutionary relationships. In this way Dr Valentine will, hopefully, unravel one of the most intriguing avian mysteries.

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NOTES ON AVICULTURE AT THE CINCINNATI ZOO, OHIO, USA.

By JOSEF H. LINDHOLM III
(Berkeley, California, USA)

The Cincinnati Zoo, established in 1873, probably remains most famous as the home of the last living Passenger Pigeon and Carolina Parakeet, which died in 1914 and 1918, respectively. In recent years, however, this oldest of Ohio's zoos has attracted international attention for many activities and achievements under its long-time Director, Edward J. Maruska, among them an elaborate insect house, the world's largest captive assemblages of cats and amphibians, a colony of twenty Gorillas, and for pioneering experiments in cryogenic storage and interspecific transplantation of embryos. Somewhat less well-known is Cincinnati's collection of nearly two hundred species of birds, of very high quality and major avicultural importance. I was therefore most pleased at the opportunity, afforded during the Fifth World Conference on Breeding Endangered Species in Captivity (hosted by the Cincinnati Zoo), to visit the Zoo repeatedly in the week of 9-13th October, 1988, my first opportunity to do so.

Cincinnati's imposing Bird House betrays its origins with bas relief friezes of Giant Tortoises and stylised spiky lizards over its main doors, sharing with London Zoo's Bird House (Prestwich & Seth-Smith, 1928) the distinction of having been built to house reptiles. Completed shortly before America's entry into the Second World War, this Reptile House was considered one of the most modern in the world (Anon. 1942). Its conversion took place in the early 1960s, following the relocation of the reptiles and amphibians to the nineteenth century, former primate house, after that building's inhabitants were given new exhibits.

Inside this building, many individual displays still give evidence of having once been reptile exhibits. The large ponds dominating the floor of the Hornbill enclosure that fills one end of the hall still house Chinese and American Alligators during the winter. At the opposite end of the building, the large glass-fronted exhibit housing a dozen Rockhopper Penguins, appears, despite its present attempted resemblance to a polar landscape, to have once been for large snakes.

Just as obviously intended for reptiles are two banks of five cages each, at right angles to the penguin display, each unit measuring 2'



D. Oehler

"Jewel Cage" exhibits for Estrildids and Quail at Cincinnati Zoo.

deep \times 2' wide \times 2½' tall ($0.61 \times 0.61 \times 0.76\text{m}$). One of these displays was serving, at my visit, as a receptacle for a "live" video monitor relaying surveillance of the breeding pair of Guam Kingfishers, not otherwise on public display. Although I have not seen such small public exhibits elsewhere in current use, the inhabitants appeared to be doing quite well; four male and three female Red Avadavats (listed as the nominate Indian subspecies), three Western Green Twinspots *Mandingoa nitidula schlegeli*, an immaculate pair of Mearn's Quail *Cyrtonyx montezumae*, three Blackrumped (or Red-eared) Waxbills, three Blue-headed Cordon-bleus *Uraeginthus cyanocephala*, a Diamond Dove with two White-headed Mannikins *Lonchura maja*, two pairs of Peter's Twinspots, a pair of Madagascar Lovebirds (extremely rare public exhibits in the U.S.) and a beautiful Ruppell's Parrot *Poicephalus rueppellii*.

Having long been interested in the potential for bird propagation in small cages, I asked Kevin Hils, a keeper in the Bird Department, if any breedings had taken place in these "jewel cage" exhibits. I was amazed to hear that over the years, in addition to expected Zebra,

Society, and Gouldian Finches, Red and Dusky Lories, Forsten's Lorikeet, Timneh Grey Parrots, Red-fronted Kakarikis, and Sun Conures were successfully bred there as well! Kevin informed me that, as at 4th January, 1989, Peter's Twinspots and the Mearn's Quail were nesting.

At the opposite end of the building was the only exhibit not glass-fronted, with aviary netting instead. Glass-ceilinged, this large display housed a pair of Rhinoceros Hornbills, not the straight-casqued Javan subspecies, but possessing casques with slightly upturned points. Two American Alligators, one "Tojo", 9ft long (2.74m) and more than fifty years old, had just been moved into a floor pool for the winter. Chinese Alligators were to follow shortly. This aviary was also inhabited by a White-crested Laughing Thrush and, so I was informed, a number of Blue-headed Cordon-bleus, which I did not see. Kevin Hils told me they are not molested, and hardly ever fly through the netting.

The other exhibits in this building are quite spacious, some remarkably tall. Along with such American zoo standards as Burrowing Owls, a Green Wood Hoopoe, Blacksmith Plovers, Double-striped Thickknees, Levaillant's Barbets, Toco Toucans, Roadrunners, Tawny Frogmouths, Nicobar Pigeons, Black-necked Stilts, Killdeer Plovers, and others, I encountered quite a few surprises.

I believe Cincinnati is the first, and so far only zoo to have bred three species of *Halcyon* Kingfishers. The first success was with the Guam Kingfisher *H.c. cinnamomina*, the first endangered, non-passeriform softbill for which a serious cooperative captive-breeding project has been organised. It is now "biologically extinct" in the wild, with only a handful of males remaining on their island, a victim, with all of Guam's other terrestrial birds, of the Brown Tree Snake (*Boiga irregularis*), accidentally introduced in the 1940s (Bahner, 1988; Weiss, 1989). Cincinnati's breeding pair (Studbook Nos. 26 & 27), were among the original 29 wild-caught founders collected by the Philadelphia Zoo, which served as "clearing-house" for most of them (Bahner, 1988). Included in the group of eight birds arriving at Philadelphia on 31st January, 1986, the third and last shipment from Guam, this pair was transferred to Ohio on 1st May, 1986 (Bahner 1988). Breeding started in 1987, when a chick hatched on 28th April, dying 13th May. A chick hatched on 12th June, died four days later. As the first chick had been parent-reared, this one had been pulled for hand-rearing (Bahner, 1988). The third and fourth chicks, hatched 17th July and 19th July, were left with their parents. While the younger chick died after ten days, the other (Studbook No. 84) is,

as far as I know, still alive, off display, at Cincinnati. A Bronx Zoo-bred female, received in May 1988, to pair with this bird, sadly died in August of that year (Bahner, 1988).

On 13th June, 1988 Cincinnati's fifth Guam Kingfisher chick hatched, and was left with its parents, only to disappear three days later (Bahner, 1988). Beth Bahner's (1988) Studbook covers hatchings through August 1988 (73 from 1st May, 1985, at six American institutions). I was thus delighted to hear from Kevin Hils, in a letter of 4th January, 1989, that "in November of 1988 we hand-reared (I presume successfully) a male and female". This is especially encouraging in that Cincinnati's breeding pair, as mentioned earlier, are wild-caught. Twenty-one of the original 29 founders were still alive as of September 1988, when the total captive population stood at 48, in ten collections (Bahner, 1988).

Cincinnati's breeding pair of White-breasted Kingfishers *Halcyon smyrnensis* is likewise maintained off-display, in a spacious cage adjoining the Guam Kingfishers. On display, however, in October, were their first three offspring, hatched in February 1988, the first of their species bred in the Western Hemisphere. This breeding, achieved with the installation of an artificial mud bank (An "open-faced box, 0.75m deep, with the open end 1.0m \times 1.5m mounted on the back wall of the aviary and filled with moist clay, top soil, sand and spagnum"), is described in detail by David Oehler (1988), Cincinnati's Head Aviculturist, in the *Newsletter* of the American Association of Zoological Parks and Aquariums. These chicks were parent-reared. Theirs was the first exhibit seen through one of the Bird House entrances, and contains a gunnite pool. By the time of my October visit, a second brood of five had been successfully fledged, and were housed in the basement. The breeding pair arrived at Cincinnati in January 1987 (Oehler, 1988). It will be most interesting to see if these birds continue to be so prolific. I have reviewed all of the *International Zoo Yearbook* breeding records for *Halcyon smyrnensis*, and have not otherwise found so many chicks produced in a given year. Frankfurt Zoo had a pair that fledged chicks continuously from 1964 to 1970, with the maximum number for one year being four (Zoological Society of London, 1966-1972). Amsterdam recorded breedings every year from 1982 to 1985; the next two years in which six chicks were hatched are indicated as years where at least one of the parents was captive-bred (Zoological Society of London, 1986-1988). If Cincinnati's pair should have a similarly long reproductive life, at their present level of fecundity, I believe, noting the presence of other recently imported birds, that an

American self-sustaining population is a possibility.

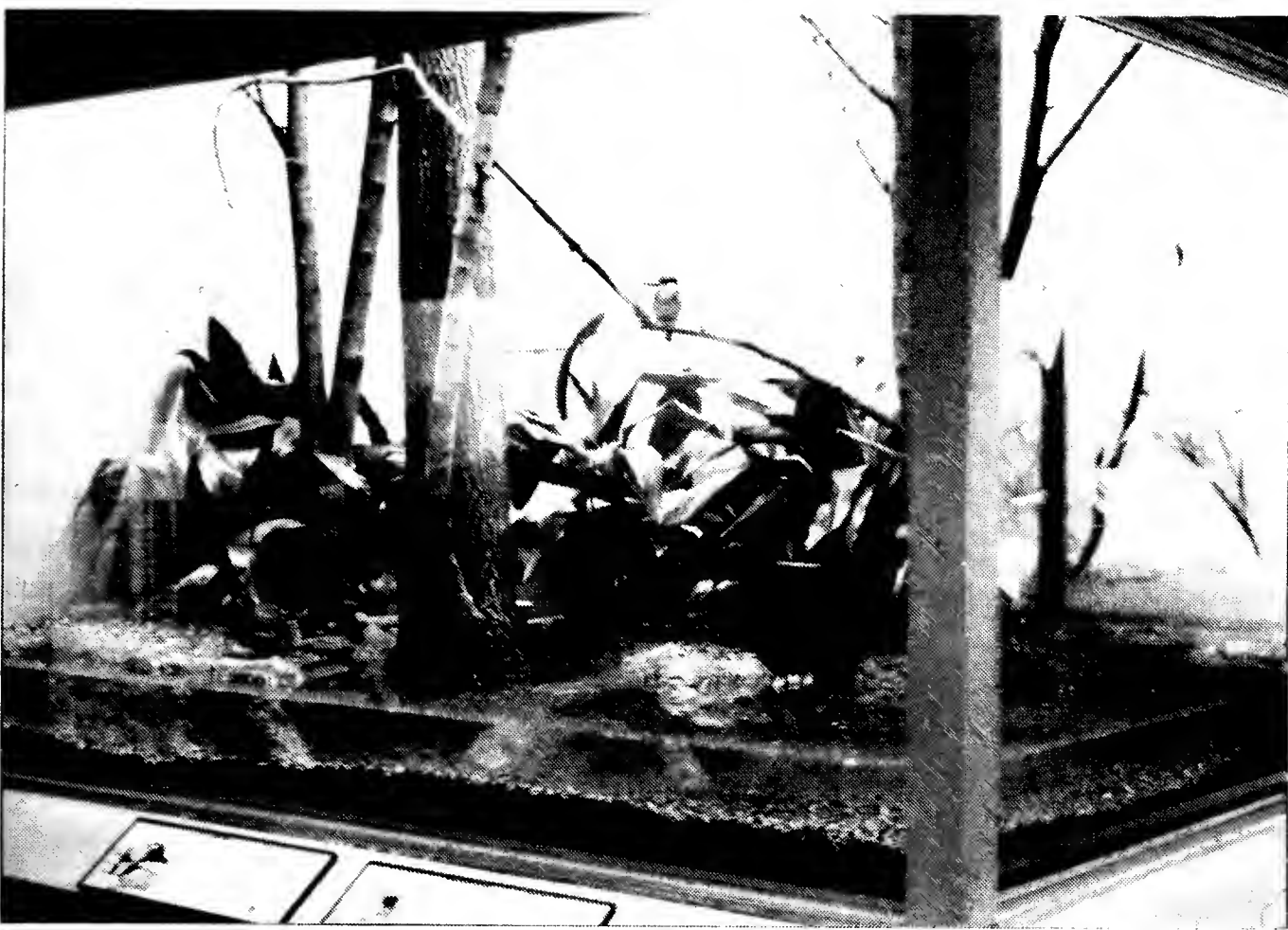
The first captive breeding of the Brown-hooded Kingfisher *Halcyon albiventris*, took place on display, in the same exhibit where, in October, I saw the breeding pair and the survivor of their second brood of three, hatched 16th July, 1988, reared by its parents. The first chicks, hatched 18th and 19th June, 1988, were successfully hand-reared (Kevin Hils, pers. comm.). This East and Central African species closely resembles the more commonly seen Grey-headed Kingfisher *H. leucocephala*, the most pronounced plumage difference being *H. albiventris*'s sandy, instead of chestnut, underparts. Another distinction is a definite dark line through the eyes, creating a boundary between the pale nape and throat and the sandy brown cap. At the end of a bank of cages, the breeding pair's exhibit has two windows, forming a corner. Water covers most of the floor of this display, also inhabited by a male and two female African Pygmy Geese.

At a right angle to this exhibit was one for three Short-tailed Green Magpies *Cissa thalassina*, a species nonexistent in American aviculture five years ago, but now to be found at Dallas and Denver as well. (Two chicks hatched at Denver in 1988 (Haeffner, 1988), perhaps a world "first".) Cincinnati's birds had maintained their green colour rather well.

Another striking sight were six Coledo Mynahs *Sarcops calvus* occupying a single exhibit, most recently acquired. Kevin Hils told me that pairs would be removed as they formed. A seventh and eighth bird had already been thus transferred to breeding facilities behind scenes. On 1st March, 1989, Kevin informed me that a chick had been recently hand-reared. There are a number of others in the U.S., six being reared at the Miami Metrozoo in 1987 (Low, 1988). It may be that this species becomes established.

Cincinnati's inventory for 31st December, 1987 lists 23 Rothschild's Mynah's, 18 of them out on loan to seven institutions. The two on exhibit in the Bird House shared their display with five Larger Malay Chevrotain or Mouse Deer *Tragulus napu*, appearing quite at ease inches from the glass, at the viewer's waist-level, in an enclosure with limited floor space. Like the flourishing Bronx Zoo herd from which these specimens are descended, it seems they thrive under close quarters. The first Cincinnati birth occurred on 6th February, 1987 (Brady, 1987). The fawn was reared by its parents.

The other Bird House exhibit shared by mammals housed three Desmarest's Fig Parrots *Psittaculirostris d. desmarestii* and five of the endangered Pen-tailed Bettong or Rat Kangaroo *Bettongia penicillata*



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Brown-hooded Kingfisher *Halcyon albiventris* in the exhibit where the first captive breeding took place at Cincinnati Zoo.

(also descended from Bronx Zoo stock and likewise reproducing in this display, which is quite long).

Less than a decade ago, Pheasant Pigeons were not seen in American Zoos. Today, the Green-naped Pheasant Pigeon *Otidiphaps n. nobilis* may be seen at Albuquerque, Miami, San Diego (where it was bred), and elsewhere, but the only publicly exhibited White-naped Pheasant Pigeons *O. nobilis aruensis* of which I am aware are at Cincinnati, where two pairs were listed on 31st December, 1987. I found two birds exhibited in a display by themselves. One had a notably longer tail.

Very much in evidence was a number of Tanzanian birds, commercially imported in 1988. A Snowy-headed Robin Chat *Cosypha niveicapilla* and a Hildebrandt's Starling *Spreo hildebrandti* shared an aviary with a male and two female Black-winged Red Bishop Weavers *Euplectes hordeacea*, a beautiful species frequently illustrated in books on cage birds, but hardly ever seen in the flesh. Another male shared a very large, arid aviary with three Golden-breasted Starlings *Cosmopsarus regius*, likewise received in 1988, along with several birds of longer Zoo residency; Blacksmith Plovers

and Double-striped Thickknees, Crested or Levillant's Barbets (the female hatched at the Pittsburgh Conservatory Aviary), a White-headed Buffalo Weaver, a Golden Weaver *Ploceus subaureus*, and a West Nile Red Bishop *Euplectes orix franciscana*.

Other noteworthy Bird House exhibits included an aviary with three species of Parrot Finches *Erythrura hyperythra*, *E. psittacea*, & *E. trichroa*, kept with two Nicobar Pigeons, a South American community display featuring, among other species, a male Bolivian Cock-of-the-Rock *Rupicola peruviana saturata*, true Saffron Finches *Sicalis flaveola*, a Black-necked Aracari *Pteroglossus aracari*, and an American Golden Plover, individual displays for pairs of African Grey Hornbills *Tockus nasutus*, Stella's Lorikeets (one was melanistic), and Guam Rails (chasing each other about with spread wings), and a cage shared by a pair of Blue-winged Pittas *Pitta moluccensis* and four Silver-eared Mesias (a very common bird in American aviculture at present, but nonexistent five years ago).

Most of the aviaries were earth-floored and planted with Aroids, Euphorbias, and other plants. Each bird was identified with beautifully painted labels, among the most attractive I have seen anywhere.

As impressive as the Bird House's public exhibits were, I discovered as noteworthy a collection in this building's enormous basement, and behind the displays. I am most grateful to David Oehler and Kevin Hils for a thorough tour of these areas.

Together in one holding cage were the five White-breasted Kingfishers from the second hatching, and the two male Brown-hooded Kingfishers from the first clutch, a wonderful sight. Seven African Grey Hornbills, hatched in 1988, occupied another cage.

The breeding pairs of White-breasted and Guam Kingfishers occupied adjoining aviaries 2.5m \times 2.0m and 3.0m in height, with potted palms. A nearby cage held a pair of Rothschild's Mynahs and Guam rails *Rallus owstoni*. Numbering in the tens of thousands in the 1960s, the Guam Rail is probably now extinct in the wild (Derrickson, 1987; Weiss, 1989), destroyed by Brown Tree Snakes. From 1983 to 1986, 21 wild Rails were collected, and 29 wild-caught and captive-bred specimens exported to the National Zoological Park's Conservation and Research Center, in Virginia, and the New York Zoological Park (Derrickson, 1987). While offspring were sent from New York to the Pittsburgh Conservatory Aviary and the San Diego Zoo (which had previously bred the species), the first specimens to leave the National Zoo's collection went to Cincinnati (Derrickson, 1987), where a pair arrived 17th September, 1986. Their first egg was removed for incubation 29th December, 1986 (Anon., 1987). Kevin

Hils informed me that, by January 1989, three true pairs had been reared at Cincinnati. The propagation of greater numbers has been discouraged, pending "completion of DNA fingerprint analyses" to determine the genetic variability and relatedness of the now more than 120 birds in eleven U.S. institutions (Weiss, 1989). Once the representation of various genes has been determined, intensive propagation will resume, with the aim of shortly introducing a large stock to the snake-free island of Rota, near Guam.

Very intensive propagation was going on nearby, with several pairs of Masked Bobwhites, maintained, like Japanese Quail, in several tiers of laboratory cages, with troughs in front for the eggs to roll into! I was told this setup presented "no problem whatever". I counted at least five eggs in the trough. The very distinctive Masked Bobwhite *Colinus virginianus ridgwayi*, long extinct in Arizona, and likely so in its Sonoran range as well, now exists primarily as a colony at the U.S. Department of Fish and Wildlife's Patuxent Wildlife Research Center in Maryland. This group is prolific; 6,853 eggs were



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Intensive breeding facility for Masked Bobwhites *Colinus virginianus ridgwayi* at Cincinnati Zoo.

laid in 1976 (King, 1981). It is intended to eventually reestablish this subspecies in its former U.S. range, but I am not yet aware of any permanent success. A number of surplus birds have been sent to zoos, but Cincinnati appears to be the only one, at present with a concerted propagation programme of its own. There were 16 specimens in the collection 31st December, 1987.

In different areas in the basement, and behind the exhibits on the main floor, steel-framed wire-floored cages were suspended above the floor, in three sizes; $3' \times 2\frac{1}{2}' \times 5'$, $3' \times 3' \times 7'$, and $4' \times 4' \times 7'$ ($0.91 \times 0.76 \times 1.52\text{m}$, $0.91 \times 0.91 \times 2.13\text{m}$ and $1.22 \times 1.22 \times 2.13\text{m}$). They housed a variety of birds in holding and breeding situations; Two male Magnificent Birds of Paradise *Diphyllodes magnificus*, both still in juvenile plumage, Dusky Lories, Blue-streaked Lories *Eos reticulata*, Red Lories *E. r. rubra*, Chattering Lories *Lorius g. garrulus*, Sun Conures, two pairs of Golden or Empress of Bavaria Conures, a pair of Grand Eclectus *Eclectus r. roratus*, Scarlet-chested Grass Parrakeets, a Black-mandibled or Wagler's Toucan *Ramphastos ambiguus*, Rothschild's Mynah's, Superb Starlings, and other parrots.

Kevin Hils provided me with a list of species bred in these simple, rather exposed cages; Red and Dusky Lories, Forsten's Lorikeets *Trichoglossus haematodus forsteni*, Timneh Grey Parrots, Peach-faced Lovebirds, Eastern Rosellas, Scarlet-chested Grass Parrakeets, Sun Conures, and Rothschild's Mynahs. Ruppell's Parrots and Golden Conures laid eggs, but none hatched.

The Zoo's third pair of Golden Conures occupied different quarters in the basement, along with quite an assortment of other parrots. Some of the more notable of these included a magnificent Palm Cockatoo that might possibly be *Probosciger aterrimus goliath*, Salmon-crested Cockatoos (quite recently declared a severely endangered species), an Alder Amazon *Amazon tucumana*, Swainson's Lorikeets *Trichoglossus haematodus moluccanus*, Green-naped Rainbow Lorikeets *Tr. h. haematodus*, Hyacinth, Scarlet, and Green-winged Macaws, and two breeding pairs of Blue and Gold Macaws, with two offspring hatched 1988 (Eight hatched in 1986 [Anon., 1987]).

A pair of Pesquet's or New Guinea Vulturine Parrots *Psitttrichas fulgidus*, returned a year before from the Los Angeles Zoo where they had been on loan, occupied one of a series of large, stainless steel aviaries in a specially air-conditioned basement room for high-altitude birds. Along with the Guam Kingfishers and a pair of white phase American Kestrels, they were the subject of constant

surveillance via closed circuit television, the console located in the Bird House office. On 1st March, 1989, Kevin Hils wrote to inform me that the Pesquet's Parrots were currently nesting, their second time this year. The two eggs laid at their first attempt were infertile. Other birds in this room, in October, 1988, were a female Javan Rhinoceros Hornbill *Buceros rhinoceros sylvestris*, its short straight casque in contrast to those of the birds upstairs, three Plate-billed Mountain Toucans *Andigena laminirostris*, then in the collection for a year, two Magpie Geese, and a pair of Southern or Leadbeater's Ground Hornbills which had ventured once too often from their Antelope House enclosure.

Other interesting birds in the Basement included the last Lesser Yellow-headed Turkey Vulture *Cathartes burrovianus* in the U.S., still a most elegant bird after more than 20 years at the Zoo, a 1988 Malay Argus Pheasant, a Red-billed Toucan *Ramphastos tucanus*, and a duck-brooder full of young North American Ruddy Ducks, ready to go to other collections. The Zoo's incubators are kept in the Bird House office.

Outdoors, on the terrace of the Bird House, are two large cages with extensive gunnite rockwork housing, respectively, a male and female Andean Condor, on loan from the Patuxent Wildlife Center, where the U.S. Fish and Wildlife Service has been breeding them for years.

Before the conversion of the Reptile House, Cincinnati's Bird House consisted of a string of seven square limestone block buildings, with ornate "Chinese pagodah" roofs, interconnected with outdoor flights (Anon. 1942). ("Chinese Birdhouses" appear to have been a pre-WWI style - The large Bird House still at the Franklin Park Zoo in Boston, built before 1915 [Hornaday, 1915], recalls a Sung Dynasty Palace.) I believe this was the location of the first U.S. breedings of the Eastern Blue Jay and the Red Avadavat or Strawberry Finch, attributed (without dates) to Cincinnati Zoo by Crandall (1917).

The last of these buildings remaining is now a museum dedicated as a memorial to its two most famous inhabitants; "Martha", the world's last Passenger Pigeon, who died 1st September, 1914, and "Incas", the last Carolina Parakeet, who died 21st February, 1918 (Getz, Wachs, *et al*, 1986). Along with mounted specimens, photographs, Audubon prints, and presentations on other extinct animals, there are enlarged reproductions of contemporary newspaper accounts of the last Passenger Pigeon, from which I gained much information. I believe the misconception still persists that "Martha"

was hatched at the Cincinnati Zoo, in 1888, according to the Zoo's 1942 Guidebook (Anon., 1942), or at least lived there continuously for more than 25 years (Mann, 1930, gives a figure of 28 years). From one of the newspaper clippings, I learned that "Martha" actually arrived at Cincinnati in 1902 from a private collection in Chicago. I imagine the breeder was Professor C.O. Whitman, who, in his Chicago aviaries is credited (without dates) by Beebe & Crandall (1919), as the first "Eastern United States" propagator of not only the Passenger Pigeon, but 26 other species of pigeons and doves as well. I imagine this record certainly applies for the entire country.

I am not certain whether the four pairs obtained by Cincinnati in 1877, mentioned in one newspaper account, are the same eight birds purchased from a Wisconsin collector, for \$2.50 each, mentioned by another. At any rate, the first clipping reports that the largest number ever maintained there was 13. I found no statistics for 1902, the year of "Martha's" arrival, but in 1907, she was the only female, two males remaining, the last of which died in 1910. (Edey, 1964, states the total captive population in 1908 was seven.) I did not find any clear indication, from the clippings, that Passenger Pigeons actually hatched at Cincinnati.

Another persistent misconception is that the last Carolina Parakeet died in 1914, the same year as the last Passenger Pigeon. I did not note much historical information on the Parakeet at the memorial museum, but a thorough coverage of Cincinnati's last specimens can be found in McKinley's article (1977) in this journal. "Incas" in fact died 21st February, 1918, having survived "Lady Jane", the next-to-last specimen, by only a few months. They were the last of at least eight birds purchased in the late 1880s. There were still eight birds at Cincinnati in 1912, when two of these were sold to the New York Zoological Park. The last of New York's birds died 25th May, 1913 (Crandall, 1945). By 1916, only two of Cincinnati's birds were still alive (McKinley, 1977).

While there does not appear to be any evidence of Carolina Parakeets hatching there, it should be kept in mind, that in common with too many other American zoos, Cincinnati went through a time when records were regarded casually. Among other results, was a letter received in 1959 by McKinley (1977), from the Zoo's Public Relations Department, to the effect that there was no clear evidence of Carolina Parakeets ever being kept there!

The Cincinnati Zoo's concerted, if unsuccessful, attempts to perpetuate Passenger Pigeons and Carolina Parakeets are a reflection on its own strong early avicultural affiliations. Dr. Edward J.

Maruska, the Zoo's Director, informed me that Andrew Erkenbrecher, a founder of the Zoological Society, in 1873, and its first Treasurer, was very much the nineteenth century German aviculturist, and also founded an acclimatisation society which imported Starlings, House Sparrows, and other less successful species. Erkenbrecher also imported a German animal dealer, Sol Stephan, as the Zoo's General Manager. Stephan, who lived to be 101, presided over the deaths of "Martha" and "Incas", and supervised the shipment of "Martha", in an enormous block of ice (depicted in the memorial building), to the Smithsonian Institution, where her mounted remains are a favourite exhibit. His son Joseph succeeded his father upon retirement, and also served the Zoo many years. In its early years, the Cincinnati Zoo was practically a German institution - its first guidebook was printed only in German, and it served, before the First World War, as the American Base of Operations for Carl Hagenbeck's great animal dealing firm. The Zoo only became City Property (with the Zoological Society maintaining administration), on 1st January, 1933 (Anon., 1942).

Quite aside from the Bird House, an impressive collection of birds is exhibited in a variety of exhibits around the Zoo's 32 acres. It was my privilege to discuss many of these displays with Dr. Maruska, as well as Steve Romo, Supervisor of Hoofed Mammals, and Michael Dulaney, Supervisor of Small Mammals, Carnivores, and Primates, both of whom also have associated birds under their jurisdiction.

Sharing the enclosure dominated by the wonderful breeding group of Central African Giant Eland *Taurotragus derbianus gigas* and several Damara Zebras, were two Marabous, a Ruppell's Griffon Vulture (since sent to the San Diego Wild Animal Park), three Eared or Lappet-faced Vultures, Egyptian Geese, eight East African Crowned Cranes, and a pair of Kori Bustards. In a nearby exhibit with a large pool, four Saddle-billed Storks, that arrived with the Kori Bustards from Tanzania in 1987, were kept with three Wattled Cranes, hatched at Brownsville, Texas, to be eventually paired with unrelated stock. A pair of Manchurian Cranes *Grus japonensis*, hatched at the San Diego Wild Animal Park, of both Chinese and Japanese ancestry, were housed with Chilean Pudu *Pudu pudu*, the world's smallest deer. A third is on loan to the nearby King's Island Wild Animal Park, where it roams a large Asian exhibit. Further San Diego specimens were expected shortly. This already most impressive collection of Park Birds was enhanced in February, by the arrival of a Shoebill, or Whalehead, of which Kevin Hils informed me. It came in with the groups received by San Antonio and the San Diego

Wild Animal Park.

The collection of nearly 30 species of waterfowl on the large fountain-dotted "Swan Lake" is particularly representative of the tribe Mergini. The 31st December, 1987 inventory lists three Bufflehead *Bucephala albeola*, nine Barrow's Goldeneye *B. islandica*, and seven American Goldeneye *B. clangula americana*. All breed here. I was surprised to find four pairs of American Goosanders *Mergus merganser americanus* listed, as well as the same number of Hooded Mergansers *M. cucullatus* (breeding), two male Smew *M. albellus*, since joined by two females, and two Red-breasted Mergansers *M. s. serrator*. The lake supports a population of fish, which, Dr. Maruska told me, afforded the successful maintenance of donated Pied-billed Grebes *Podilymbus podiceps* in the past.

The lake is surrounded, not by a wall or fence, but a variety of vegetation, providing abundant nesting shelter. On 30th May, 1986, Zoo gardeners retrieved, for incubation, ten eggs of the West Indian Tree-Duck *Dendrocygna arborea*, as well as three eggs each of American Wood Duck, Bufflehead, and Hooded Mergansers (Anon., 1987). In a winter holding area, in the labyrinthine basement of the Gorilla House (which also houses two species of African Mole Rats, and 17 Japanese Giant Salamanders, among other things), Michael Dulaney showed me a large flock of West Indian Tree Ducks.

In a tributary of the lake, near the islands for White-cheeked Gibbons and Siamangs, was a small flock of flamingoes, mostly Chilean, with two Caribbean and a Lesser as well. At the nearby Joe H. Spaulding Children's Zoo, I found a gunnite outdoor exhibit for Magellanic Penguins, near the new Walrus enclosure, and American Magpies *Pica pica hudsonia* kept with Northern Burrowing Owls *Speotyto cunicularia hypugaea*, as part of a desert complex.

A desert exhibit, featuring Masked Bobwhites *Colinus virginianus ridgwayi* and Cactus Wrens *Campylorhynchus brunneicapillus couesi*, with three Marine Toads *Bufo marinus*, was an unexpected feature of the insect house - One of a series of displays entitled "What Eats Insects?", which also included Archer Fish *Toxotes jaculator*, Goliath Frogs *Gigantorana goliath*, Goeldi's Monkeys *Callimico goeldii*, and other species. Cactus Wrens are, so far as I know, the only Wrens to be seen in American Zoos, otherwise displayed, to my knowledge, at Tulsa, Oklahoma, and the Arizona-Sonora Desert Museum, at Tucson (where they have repeatedly bred). Cincinnati's two birds were tame and very much at ease among the artificial rocks and ledges in their large glass-fronted enclosure, made to resemble a

dried-out creek-bed. I thought their eyes remarkably small in proportion to their size.

In the spacious, very densely planted, walk-through "Butterfly Rain Forest", the first of its kind in America, I did not see the four Ruby-throated Hummingbirds *Archilochus colubris* or three Rufous-tailed Hummingbirds *Amazilia tzacatl* that have been there well over a year, but a beautiful male Grey Peacock Pheasant *Polyplectron bicalcaratum* perched on a branch over the path was prominent. He seemed oblivious to the *Dryas julia* and *Heliconius charitonius* Butterflies fluttering around him, but an insect keeper told me dismembered wings are occasionally found beneath his perch – never enough to prompt his removal. This species is propagated elsewhere at the Zoo.

The central unit of a huge, steel-framed and gunnite-backed three-cage Pheasant Aviary, at the south-eastern perimeter of the zoo, was empty, probably for the winter. The other two well-planted cages, however, were occupied, respectively, by Satyr Tragopans and Malay (nominate subspecies) Argus Pheasants, both currently breeding.

A male Green Peafowl (listed as the nominate Javan subspecies), was a striking feature of the steel-framed, out-door, walk-through aviary, full of Sycamors, where I also saw eight Scarlet Ibis, four Waldrapp, Cattle Egrets (which breed), a Mute Swan, a Satyr Tragopan, Asian Purple Gallinules *Porphyrio poliocephalus*, a Laughing Gull *Larus atricilla*, Spotted Pigeons *Columba guinea*, and two Wagler's Toucans *Ramphastos ambiguus*.

A huge suspension-netting aviary of the "telephone-pole" sort popular in American Zoos since the 1970s, once housed a "stamp collection" of birds of prey, but now holds only a breeding pair of Southern Bald Eagles *Haliaeetus l. leucocephalus*, whose offspring have been released in Ohio and Tennessee (Getz, Wachs, et al 1986).

Of similar importance is the pair of American Barn Owls *Tyto alba pratincola* exhibited in the Nocturnal House in the midst of a wonderful collection of prosimians, bats, and other mammals. The breeding activities of these birds has been well described by Michael Dulaney (1986). At the time his article was published in this magazine, this pair had "successfully hatched and reared some 70 young". By October 1988, the figure stood at 87. At my visit, Michael pointed out a chick, with the pair, in their glass-fronted, blue-lit 8' × 12' × 12' (2.44 × 3.66 × 3.66m) display, very convincingly made to resemble a corner of a barn, with farm implements on the wall, and hay bales on the floor. The female and

chick were in a corner, on the floor, with no nest at all. (Though nesting often takes place on the floor, it may also take place in the hay-loft, several feet above the floor). The male and female arrived in March, 1980, from Louisiana and South Carolina respectively, commenced breeding in 1981, and have produced at least two clutches a year ever since.

Though still wide-spread, the American Barn Owl is, for a number of reasons, much rarer, in many places, than formerly, and, in some cases, locally extinct. I remember a morning's Ornithology class excursion, in Northern California, in 1984, when six or seven "road-killed" Barn Owls were retrieved along a rather short stretch of road, all struck by cars in the dark, presumably while chasing rodents. Michael Dulaney (1986) wrote that, while some of the off-spring had been sent to zoos, and nature centres, "the great majority" were released in Ohio and Indiana. At present, he told me, half are liberated, the others going to zoos, where the demand is high. Cincinnati Zoo has also released captive-bred Killdeer Plovers *Charadrius vociferus* (Anon., 1987).

The other bird exhibit in the Nocturnal House was once a broom closet and is serviced from the front, the window also serving as a door. It houses a pair of Screech Owls *Otus asio* of the red phase which has so far laid eggs, but not yet hatched any.

Those wishing to contact the Cincinnati Zoo may write: Cincinnati Zoo and Botanical Garden, 3400 Vine Street, Cincinnati, Ohio, 45220, USA.

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REMINISCENCES OF RARE MUNIAS PART II

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(Hong Kong)

(Continued from previous issue)

THE HOODED MUNIA *Lonchura spectabilis* has been in my collection for three years and my fortunes have been mixed but despite serious breeding attempts each year no eggs were ever hatched. There are four races, the nominate comes from the island of New Britain and has given the species its common name of New Britain Munia. This is unfortunate as the race we have received in England is *L.s. mayri* from Papua New Guinea. It is a small munia, about 95mm, exquisitely proportioned, lively and curious. It does much better in my experience in a birdroom or aviary than in a cage, but in the case of the latter it does depend on circumstances as I'll explain later.

THE NEW BRITAIN MUNIA *L.s. spectabilis* has the head black, merging into the chocolate-brown back. The wings are also chocolate-brown. The rump and uppertail-coverts are reddish-gold, with a slight yellowish fringe to the longer coverts and the two central tail feathers. The throat, breast, belly and flanks are creamy-white, cream in fresh plumage, and may well be washed and flecked with brown in first adult plumage. The undertail-coverTs are black. The bill is pale blue-grey, the legs and feet variable – grey to blackish. The sexes are absolutely alike in plumage. Juveniles are typical warm brown above, buffish below. They very soon show some black on the head.

MAYR'S MANNIKIN, or MAYR'S HOODED MUNIA *L.s. mayri* (Fig. 10). has a noticeably smaller bill, the upperparts are a lighter brown and are cut off cleanly from the black of the head; the rump and uppertail-coverts are paler, more yellowish. The Hooded Munia *L.s. wahgiensis* is like *L.s. mayri* but is duller above rump and tail straw-coloured, but very pale. *L.s. gajduseki* is darker than the other New Guinea races and has the breast deep buff.

It is a common bird of mid-mountain grasslands, and apparently is very easy to catch. (Not so in my bird room!) It settles in quickly and well and is easy to maintain in good health on a simple all-seed diet. Derek Goodwin mentions that Immelmann recorded grass pollen as being most important in their diet. While on a visit to Turkey I went



Fig 10: Mayr's Hooded Munia *Lonchura spectabilis mayri*.

out of my way to obtain some 2lbs of fine grade pollen and looked forward to the birds' response. Not only would the Hooded Munias not touch the pollen, no other bird would either. I tried it dry, softened with water, honey, and mixed some (successfully) in my home-made softbill universal food. Most of it went into our home-made muesli. I met Immelmann in Australia a few years ago and asked him about the pollen. He told me it was simply that he had observed the Hooded Munias, when faced with a choice, feeding on flowering grass heads in preference to grass in any other state. In this, he pointed out, they are no different from any other munia.

Neff was apparently very successful in breeding the species in Germany, recording that his wild-caught birds reared their young entirely on seeds, soaked seed and chickweed, etc., not taking any livefood. Subsequently his captive-bred birds freely took mealworms, ant pupae and egg food.

My first experience was with three birds from Germany, presumably wild-caught stock for they came with the Black Munia, Grand Munias and some Chestnut-breasted Munias *L. castaneothorax shar-*

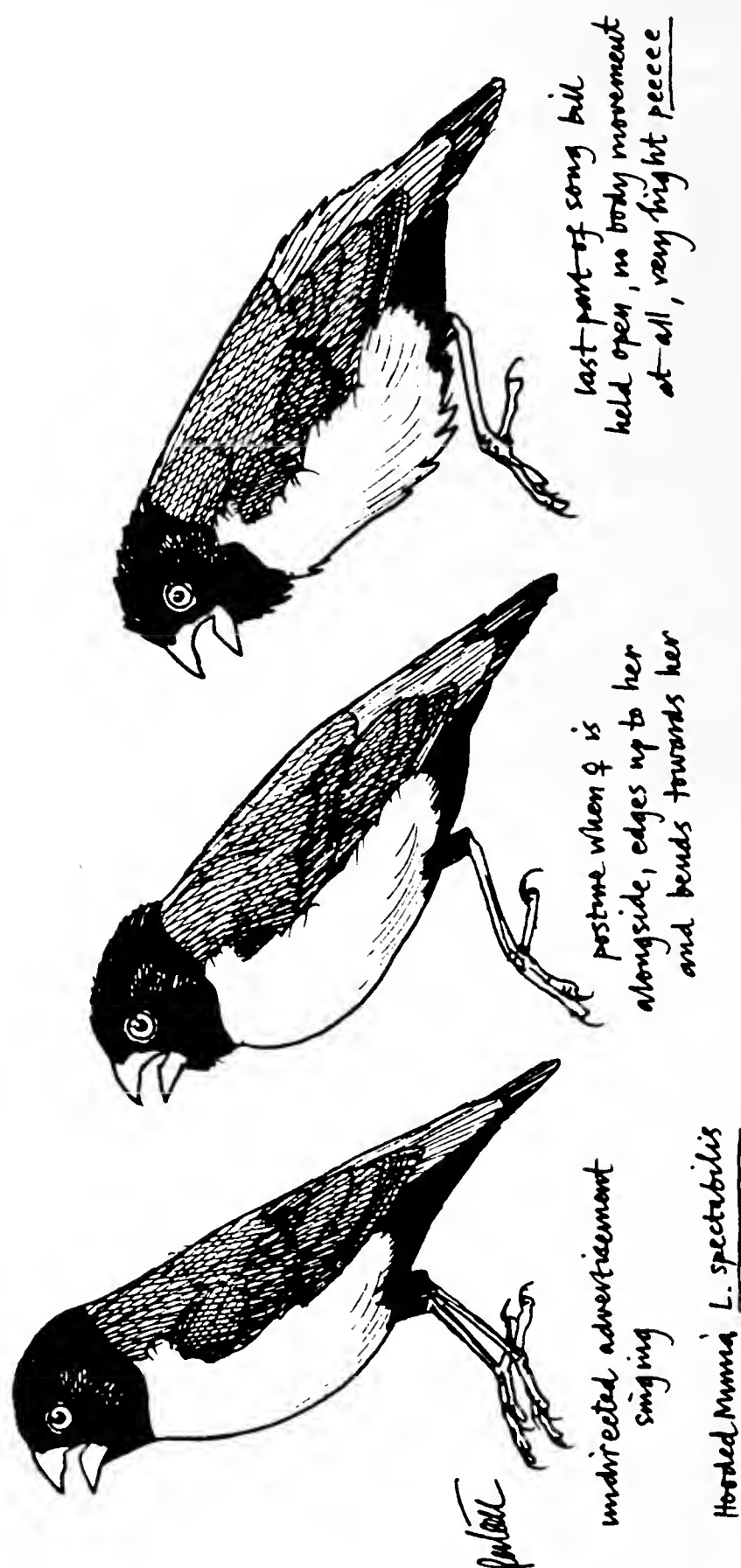


Fig 11: Three stages of courtship singing by male Hooded Munia.

*p*ii. They were duly colour-banded and placed in a large flight cage with two small *Ficus benjamina* in it. They turned out to be three females. It was 18 months before I was able to find more birds. Tess Hisley had three in a shipment from Germany, and I snapped them up. I took each bird from the transit box banded it, measured it, and released it into the 2m long breeding cage where the three females were. By pendulum (yes, the old gypsy sex-divining trick) and culmen I judged two be males. Each burst into song within seconds of landing next to the incumbents. The third bird was “sexless” and did not sing. A few months later he showed himself to be a male, as I did see him sing.

The song is a typical *malacca*-type song, but is first noticed (by my middle-aged ears) by a very high pitched *weee*. An enthusiastic, promiscuous male, engaged in opportunistic courtship, will sing with body mainly upright, head turning from left to right with a slight bobbing of the head. The throat is pumping and the whistle becomes pulsating.

In advertisement display a male will begin singing with the bill opening and closing, and a slight hint of bobbing (no turning or twisting) but it soon becomes virtually motionless. When the female is alongside, the head feathers are erected and the body is filled out. The male edges towards the female with little hops, and bends towards her. The last part of the song, has the male leaning forward more, with the bill held open; there is no noticeable movement and the song is a continual high-pitched trill, (Fig 11.)

The 2m breeding cage was built to be partitioned but I only use the slide when I need to catch a bird (Fig 12). Each male took possession of a nest as it came into breeding condition and would sit on guard at the entrance. The first was an Australian Finch Society half-open box with a perch, hanging on the door. Next to go was a half-open cardboard box with a wire mesh roof at the other end of the cage. Finally the “sexless” male took the basket in the middle. The six birds were happy and lived in a very peaceful community. Eggs were laid in boxes 1 and 3, but were clear and were eventually deserted. Filled eggs were laid but were deserted. The roof of this cage was the reeded, heavy duty perspex roof of the bird room and I discovered it was the favourite trysting ground of the local cats, and was a short cut for them from one garden to the other. I removed the cage fronts and allowed the birds the run of the bird room and access to the aviary. In the aforementioned disaster of the children on the roof of the flight, two females escaped. All this happened in the spring of 1988. That summer Ron Miller brought in some rare New Guinea Munias, and

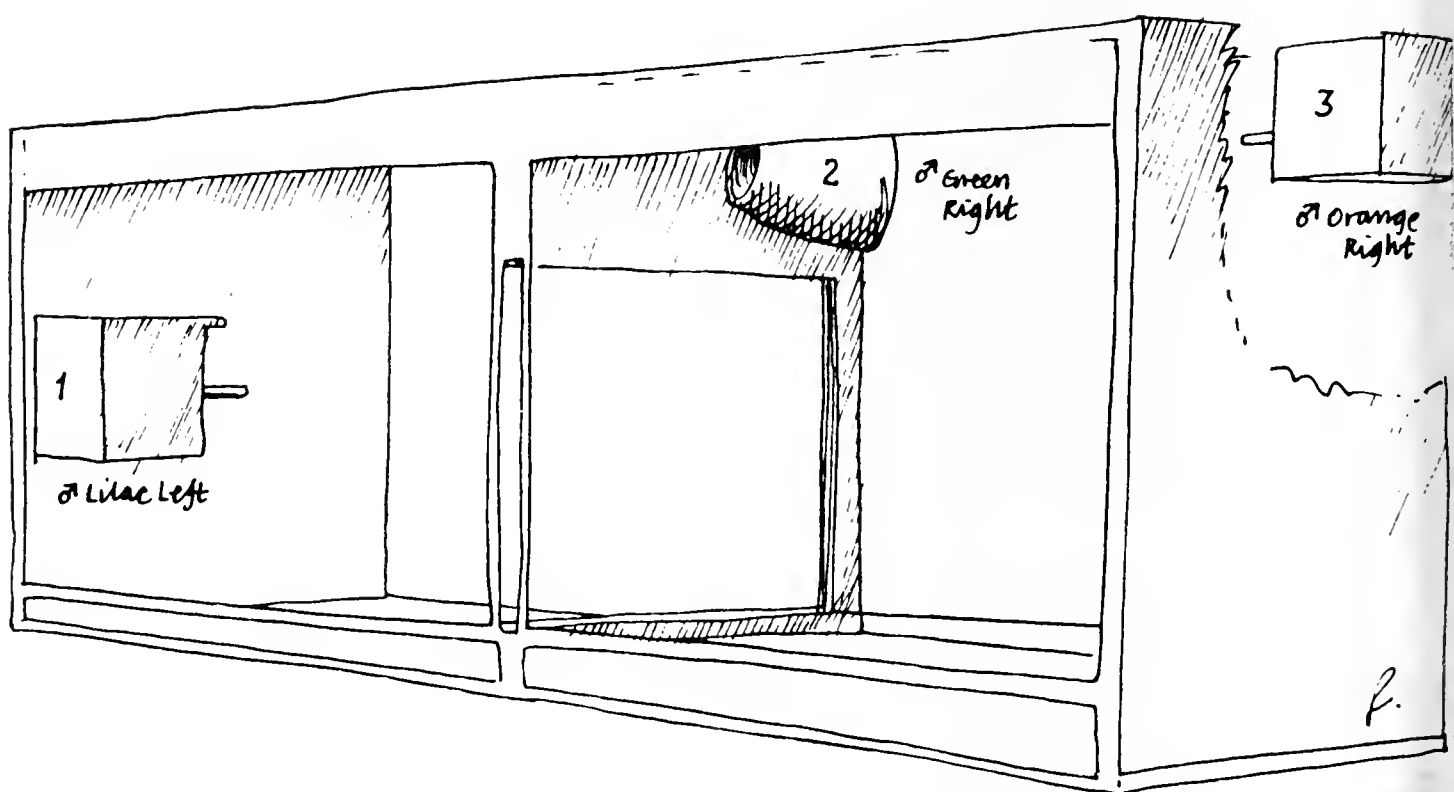


Fig 12: Breeding cage in which three pairs of Hooded Munia attempted breeding.

among others I took four Hooded Munias. Ron was very cooperative and I was able to separate the birds each to its own cage, and listen to the call notes. I chose two pairs that were of different tones and, sure enough, had selected two cocks and two hens.

These birds were banded, and released one at a time. This time in contrast to when I released birds before, the resident birds were mostly male and the contrasting behaviour is worth noting. The first bird out was immediately raped by first one male and then another. The poor bird, a female by my analysis, was then allowed to sit among the group (looking somewhat cowed, I thought). The same routine happened with the second bird. The third bird resisted, I had decided it might be a male. It was sung at in high intensity by one of the resident males who attempted to rape it but failed. For some reason I failed to note down what happened with the fourth bird (lesson: keep up-to-date notes).

The flock immediately became the dominant species in the collection by virtue of their boundless zip and energy. They would stand up fearlessly to any of the other munias, despite being the smallest. Only the Timor Sparrows, 50% larger, commanded respect. Often, four or five of them would gather on top of a nesting terrace and sit peacefully resting up.

In this situation one or other male would stand up and would sing, undirected, head level, bill open. After pumping up several *weee* he would produce up to 25 or 30 *peee* one after the other.

A bonded pair stay very close to each other, the male standing sentinel, very alert, while his mate feeds, waiting for her to bathe first. When she flies off he follows immediately. At talks I've given to clubs around the country I've often mentioned what an old bird hand in Australia told me about sexing Red-headed Parrot Finches. "It's easy, he said "the female flies off first, and the male follows. If your birds are banded you can soon build up a list of what's what." This has always produced derisive chuckles from the audience. However, it's true of most if not all the munias, parrot finches and grass finches I've studied and been able to identify pairs. Another way to tell pair-bonded *L. spectabilis* is that the male, perched close to his mate will sing to her low intensity, leaning forward not standing upright, followed by the male preening the female. I have not recorded mutual allopreening in this situation, that is to say, I've never seen the female return the attention. At the time of writing (December 1988) two pairs are actively nesting in the birdroom.

THE TIMOR SPARROW *Lonchura (Padda) fuscata* is a particular passion of mine. I first saw them, about 40 adult birds, in a couple of cages in a holding station in Jakarta in June 1987. They were being fed on plain paddy rice but seemed to be in good condition with tight glossy plumage like that of the Java Sparrow. Later that year an importer received a shipment direct from Jakarta, the only direct importation to my knowledge, other birds reaching England via Germany. I took three pairs, three birds in adult plumage and three immature. On being released into a large, all-wire holding cage, so that I could observe their behaviour and control their food, they were at once all over the mixed grit and the plain paddy. Very soon they were taking mealworms, lettuce and slices of orange. Within a week they were taking the foreign finch mix (mostly millets), my own special oily and long seeds mix, and millet on the spray. With the widening of their diet however, they would no longer take paddy, nor lettuce nor orange, but would still nibble at apple and pear. Meal worms were ignored now.

I divided them into two cages, adults in one and juveniles in the other, but this was not successful. The adults bickered all the time, the young birds were moulting and simply sat around somewhat fluffed and not looking too good. A month later I released all six into the birdroom (without access to the indoor flight nor outside), and was able to observe their behaviour as a flock.

It is a large munia, some 130mm long. The adult has the entire head black with a large, white check patch. The lower throat, upper breast and entire underparts are a cold brown; tail black. The lower

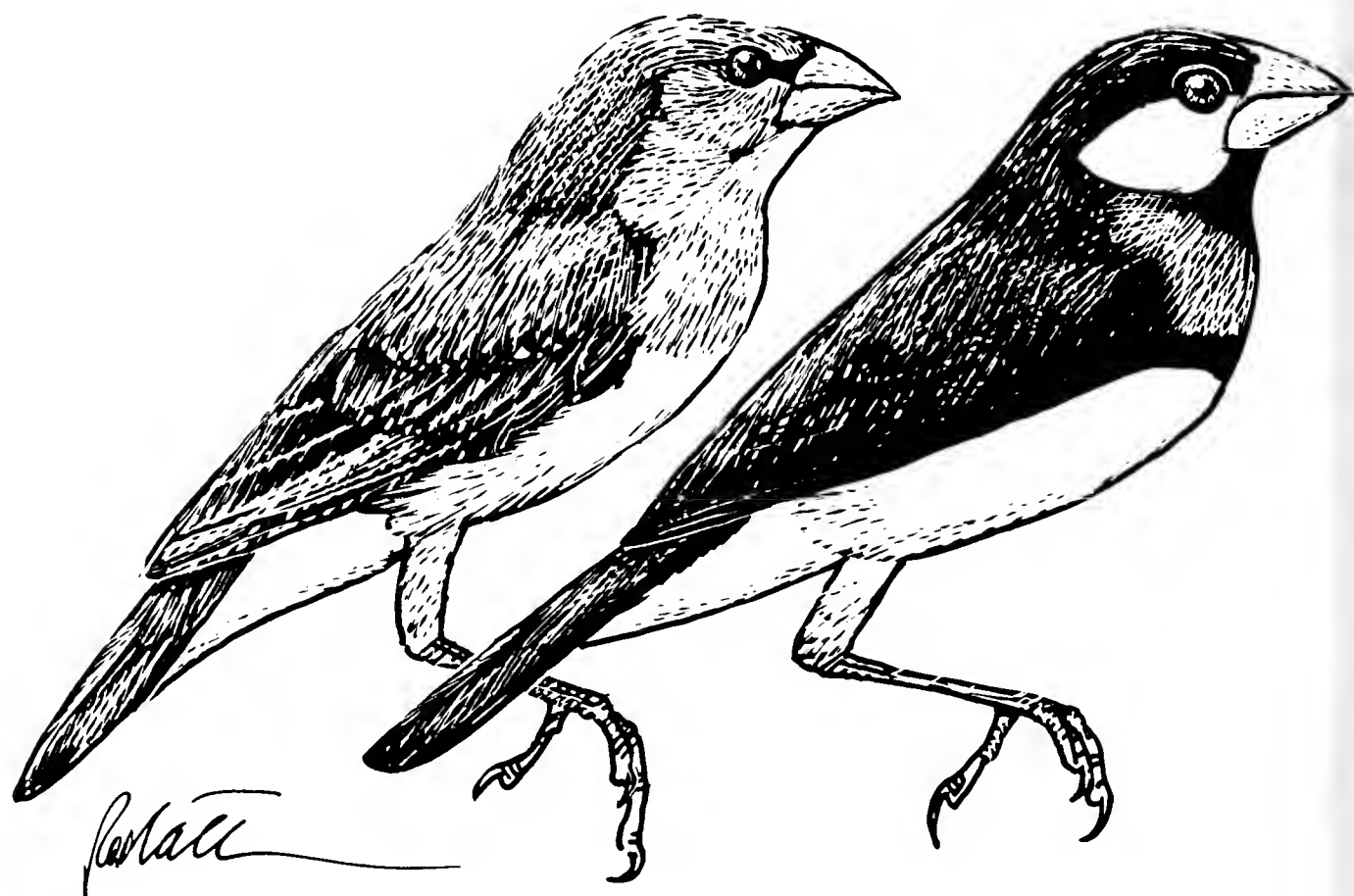


Fig 13: Timor Sparrow *Lonchura fuscata*, juvenile (left) and adult (right).

breast and rest of underparts are white, separated from the brown breast by a black line. The bill is pale blue-grey, the legs and feet pale vinous-grey. The sexes are alike and despite knowing my males and females by band colour, I've never been able to note any reliable visual sexual difference. After careful observations of two proven pairs it seems that males are darker and glossier, the females browner on breast and mantle. This is looking at very healthy, fresh-plumaged birds (Fig 13). The juveniles are greyish-brown above, pale greyish brown below. The lores are dark. To the best of my knowledge this is the only juvenile munia with dark lores.

My original six turned out to be four males and two females. The two females were soon paired up and I caught up the two odd males. I obtained the three remaining birds from a shipment bought in from Germany and was fortunate to receive two hens and a cock bird. Out of these three and my two odd cocks I kept the best pair and exchanged the three left over for some Dickcissels and Clay-coloured Sparrows. So I had three bonded pairs. You can imagine that I looked forward to the season with some keen sense of anticipation.

The pair that seemed most intent on nesting were placed in a breeding cage about one metre cubed. The other two pairs had the run of the establishment, indoors and out. One pair escaped with the roof accident, the male of the caged pair died in the nest during my

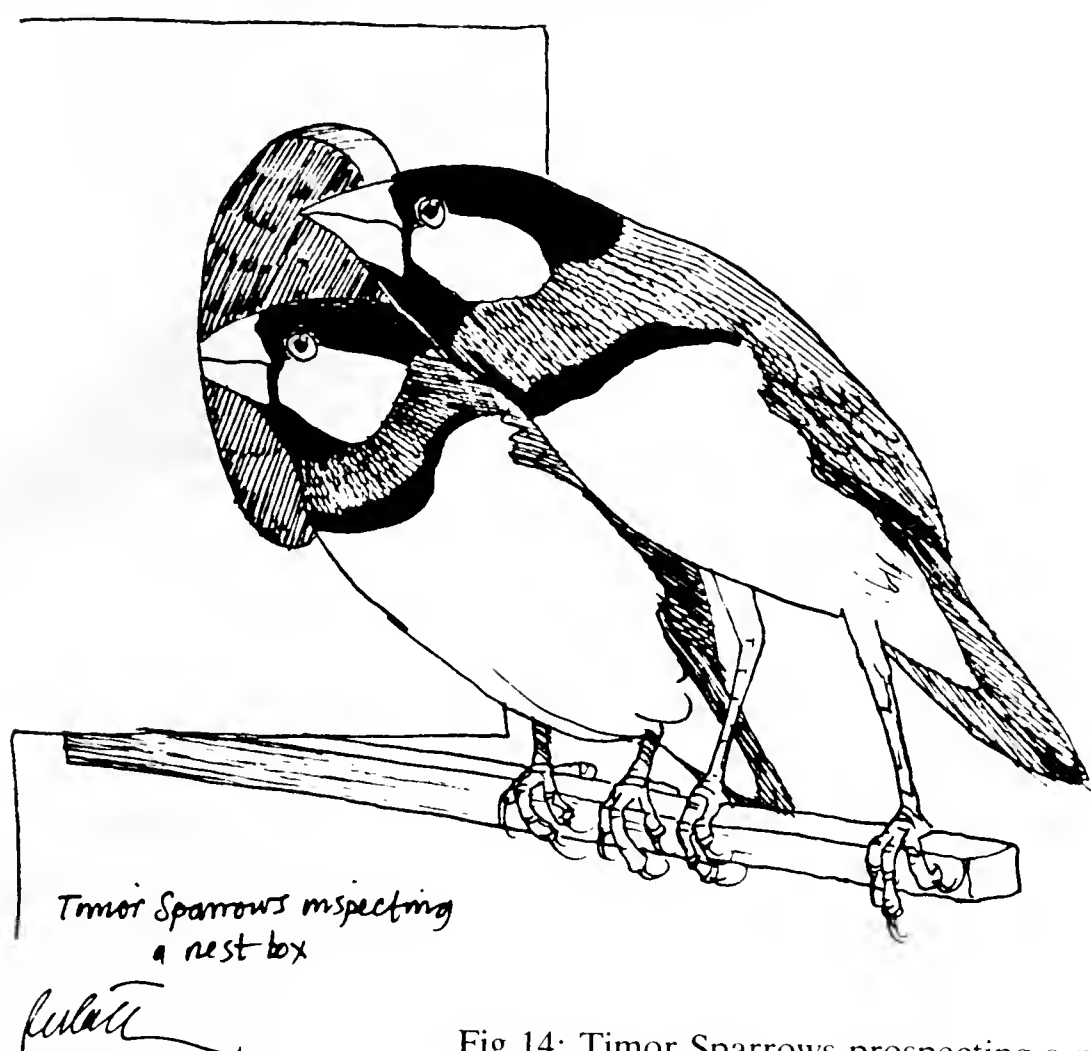


Fig 14: Timor Sparrows prospecting a nest-box.

absence on a trip. His foot was entangled with some raffia nesting material and he had been unable to get out. So at the time of writing I'm down to one pair and an odd female.

There was some serious nesting activity during 1988 (Fig 14.) but no eggs to my knowledge.

Timor Sparrows have a distinct ritualised greeting between paired birds. I noticed this many times during the first few months.

I watched one pair, White Right and Yellow Right. After feeding they would fly up to the same perch and perform an odd display that appears to be half-way between peering and aggression (attack threat). The birds bent forward, bills opening and closing and uttering a quacking (Fig 15). The whole event lasted about 20 seconds and was completed by mutual preening. Red Left was seen singing and displaying to Cerise Left, and they too were obviously paired up. I watched the greeting display several times with them and noticed there was little bill movement. In all instances I noted the bills were open with only the slightest mandible movement. Both birds remind me of immatures food-soliciting.

There were two nest-boxes, each stuffed with coconut fibre, on a shelf by the window. White Right and Right Yellow were inspecting one of these. They were seen together on top of the box in the

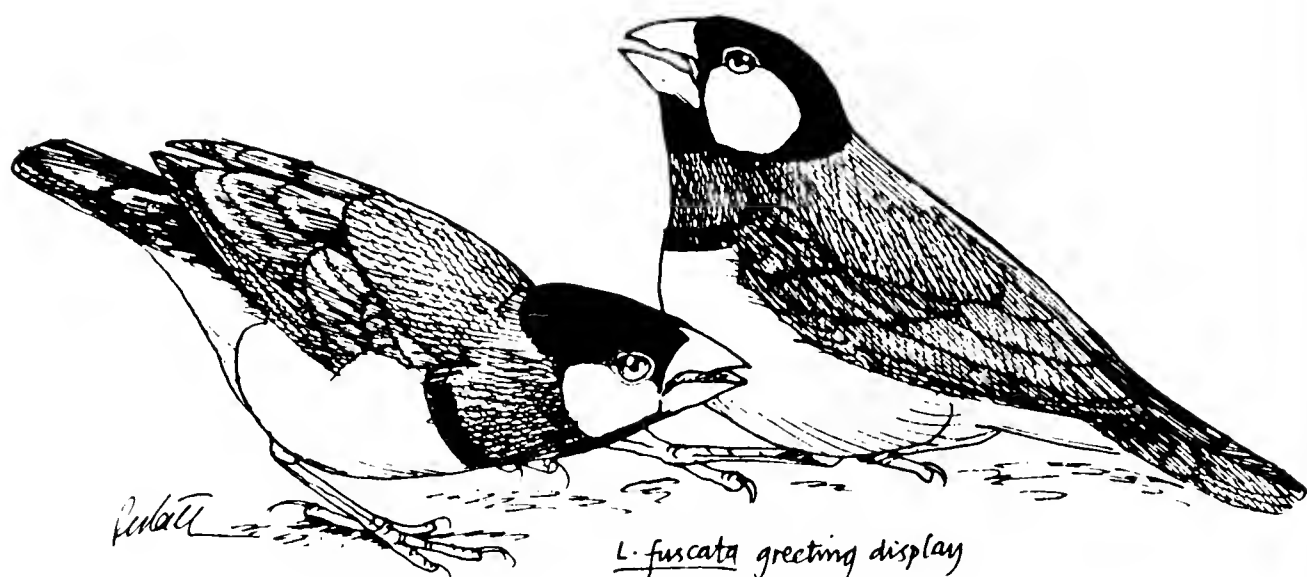


Fig 15: Greeting display of Timor Sparrow.

greeting display, each pointing in the opposite direction to the other. First one then the other opened its beak and at one point both were crouched with bills open. The angle of the body is about the same as that of a female soliciting copulation. In most cases I observed, the birds were head to tail and if one (the male?) alighted next to the other on a perch, it would hop about-face before bending in greeting. Generally, this behaviour was noted on flat surfaces. Often another Timor, one from another bonded pair and invariably the female, would join the greeting couple and break up the party with much quacking and clicking.

On one occasion I saw three Timors sitting on the top edge of a feeding cage on the feeding bench. They were maybe 10in. apart. The centre bird was WR. He spotted his mate YR up on the shelf a metre or so away, and went into the greeting posture directed at her. YR flew down to alight between him and one of the other two, whereupon WR and YR interacted. The other two on the outer sides completely ignored the proceedings.

The undirected song is quite different from that of the Java Sparrow. I have written it down in various ways. My first impression was *clik clik clik clikliklikli*. The bird performing advertisement song, stands clear of the perch moving slightly from side to side but not pointing at any other bird in the vicinity. On another observation I wrote, "Pink Left in full song 19 Feb. Stands on top of nest box and nearby cage and performs full advertisement song *chip chip chip chipchipchipchip* (gurgling, gargling *chip*). The note rises as the *chip* becomes more rapid and runs into a "gargling chip". He then flies to the other end of the bird room, sits silently for a moment, flies back to the song area and repeats song four or five times. No dance."



Fig 16: Male Timor Sparrow in high-intensity directed song.

On another occasion my notes read "Mating song. Red Red perched alongside Cerise Orange and sang. Difficult to hear but seems more munia-like than PL but with jumping clear off the perch with both head and tail twisted towards the female," (Fig 16).

Upon my return from a month in South America I found Pale Green-Pale Green singing vociferously and I realised I had never had more than one bird singing at any one time. It seems as though one male would be dominant for a while then, once breeding activities were underway it would quieten down while another male hopped into the limelight. PGPG was undoubtedly bonding to Dark Green-Dark Green and I caught them up to see if they'd breed in a flight cage.

Early on, when I was sorting out the unpaired birds, an odd unpaired male, Lilac Right-Dark Blue Left, came into breeding condition with such enthusiasm that, in his frustration at not having an available unpaired female, courted a male Fischer's Whydah and attempted to mount it. He tries hard to muscle in on WR and YR. One entry reads "... LR DBL in feeding cage when YR enters to inspect the nest box hanging in the corner. He immediately assumed the role of her attentive mate. Meanwhile WR is on top of her cage furiously hopping about trying to get through, threatening LRDBL who, with bill open, lunges up at WR. He stops for a second, remembering where the entrance is, and quickly enters the cage".

There was a noisy altercation between the two males, meanwhile YR flew off. This left WR and LRDBL looking decidedly sheepish. I caught up the latter and caged him with a few other solitaires.

One pair, in a breeding cage about a metre cubed, went to nest in a half-open front box. They built the nest with raffia, coconut fibre,

and white cotton threads. I could hear the whining *weeeeee* from one bird inside, and assumed this to be the male coaxing or enticing the female to enter. This began in March. In May upon my return from a long trip overseas I found the male dead in the nest, his foot tangled in the raffia holding him trapped within.

My remaining three Timor Sparrows are a bonded pair and an odd female. But they behave like normal flock birds. I have not heard a song for months, and not seen any greeting and assume they will moult over the winter and come back into breeding condition in the spring. Meanwhile the *L. teerinki* and *L. spectabilis* in the same enclosure (Remember, its now December 1988) are now actively nest-building!

THE WHITE-SPOTTED MUNIA *Lonchura leucosticta* is a very attractive munia. It has a bright personality and a cheerful Zebra-finch like call. It has bred well in Germany and undoubtedly has the potential to become a welcome addition to the list of semi-domesticated finches in Europe. I acquired a pair which had been imported from Germany in late 1986. They were the only two birds in the shipment and I hoped they would be a pair. Unfortunately all the wishful thinking in the world won't turn two hens into a breeding pair, although they will eventually go to nest and lay eggs, and may even sit on them for a while as mine did. I kept this pair in a one metre cubed breeding cage with a wire mesh front and a reeded perspex top. The cage contained a *Ficus benjamina* and a small privet. An ideal enclosure, but cut off from my spy window into the birdroom, so I was never able to observe their behaviour. As two females, I doubt I'd have seen very much anyway.

The White-spotted Munia is about 105mm long. An adult bird is dark earth brown on the head, wings and tail; the mantle, wing-coverts and lower back being more like dark chocolate. The breast and flanks are rich sandy-brown to chestnut, ventral region dark brown and undertail-coverts black. The lower rump and short uppertail-coverts are yellowish-straw, but the long uppertail-coverts are black. The white spots of the common name are profuse on the face, then run in rows of terminal spots back over the head, neck and mantle. Each wing covert and tertiary has a sub-terminal white spot. The spots run down the upper breast and along the flanks. The bill is pale bluish-grey; legs and feet pale grey.

First year adults are very similar and difficult to sex, but in birds that have moulted into full adult definitive plumage the male appears to be more brightly coloured, darker brown above and more chestnut on the breast and flanks. The female is said to be more spotted but I

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was not really aware of this. In a group of five young adults I examined in Singapore recently the spotting was as varied as the five birds, and there was no difference in browns. Maybe it is the slightly less-profusely spotted breast and flanks that enhances the chestnut. In my experience, the male has black heels, the female dark brown. Also the female has slight pale edges to the undertail-coverts whereas those of the male are pure black.

I have seen one juvenile in Singapore. It is unmistakable and could never be confused with the young of another *Lonchura*. It is earth-brown all over, darker above than below. The undertail-coverts and long uppertail-coverts are very dark brown (this alone would indicate either *L. leucosticta* or *L. tristissima*). It has whitish spots on the face which extend as short streaks over the crown, ear-coverts and throat. There are a few whitish spots on the side of the upper breast. The only white spots on the back and wings are sub-terminal on the median and greater wing coverts. Bill, legs and feet are pale grey.

The call note is a distinctive *peep*, almost like the *toot* of the Zebra Finch. The male and female have a slightly different tone of call note, so the dividing up and separation of unpaired birds will enable the selection of pairs with reasonable certainty.

I discovered that Mick Plose had a true pair of White-spotted Munias and gave him two. We figured he would stand a better chance with one male and three females in an aviary than just the single pair. Owing to construction of a range of flights being completed late, they did not go out until July and did not go down in 1988.

THE STREAK-HEADED MUNIA *Lonchura tristissima* is fairly wide-spread over much of New Guinea. It is apparently quite variable in plumage although the pair that Patrick Tay has in Singapore are quite predictable. It is the same size as the White-Spotted, and looks like a darker version of the juvenile of that species (Fig 17). While I'm reluctant to accept Derek Goodwin's suggestion that *L. stygia* and *L. nevermanni* are conspecific I find the similarity between *L. leucosticta* and *L. tristissima* very interesting. They are surely sibling species at least, and quite possibly *leucosticta* is a local sub-specific variant.

The adult bird is dark earth brown all over, darker above, warmer below. The lower rump and shorter uppertail-coverts are yellowish-straw, the long uppertail-coverts and undertail-coverts are black. There are a few white spots on the face, and superciliary, with whitish shafts to the head feathers giving a more streaked appearance than

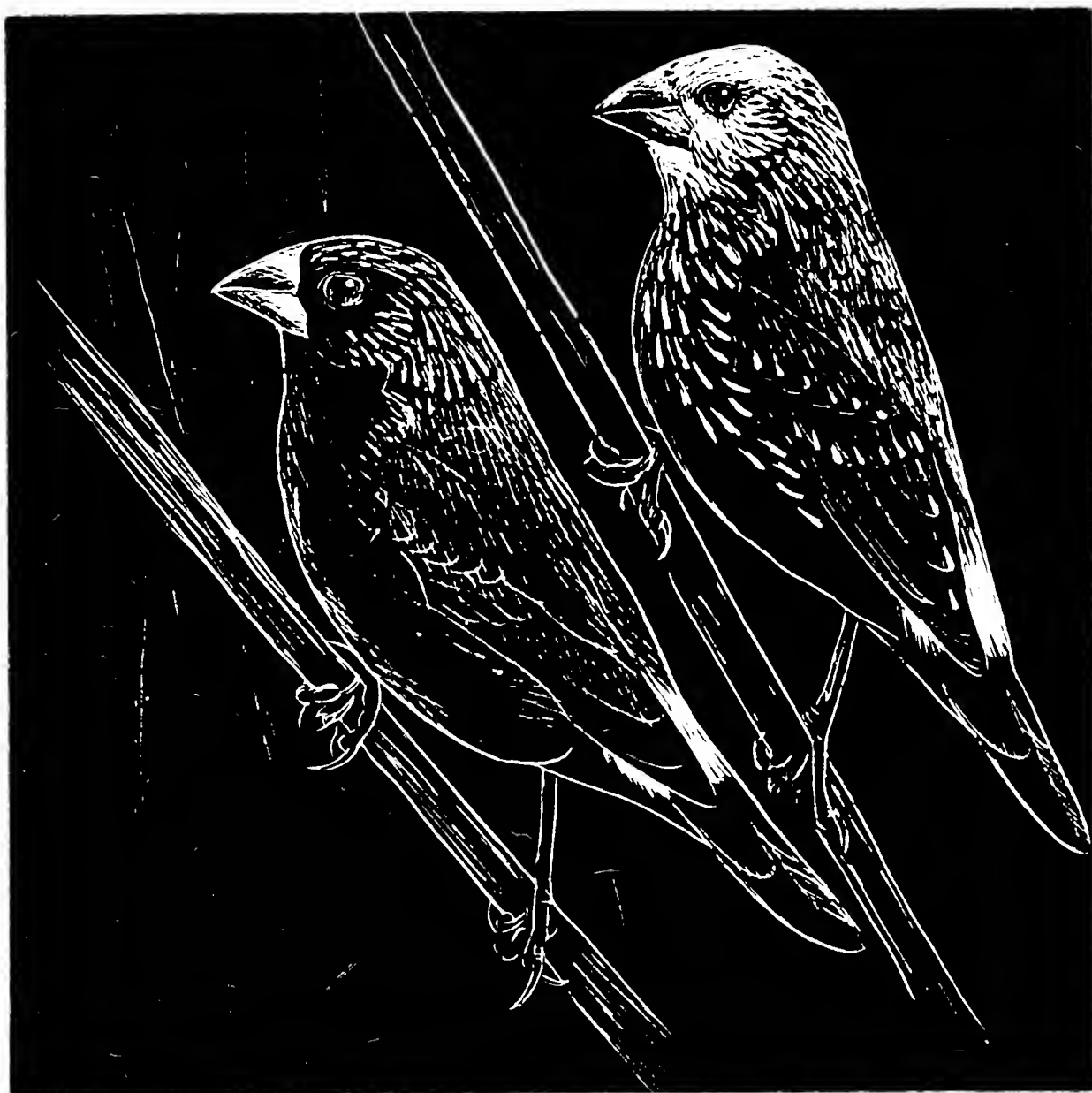


Fig 17: Streak-headed Munia *Lonchura tristissima* (left) and White-spotted Munia *L. leucosticta* (right).

spotted. According to Rand and Goodwin but not Beehler there are pale, indistinct spots to the wing coverts that may form a faint wing bar. A beautiful "head and shoulders" portrait in Lindgren suggests a double sub-terminal spot, one either side of the shaft. The certain discriminator between this species and the White-Spotted is that *tristissima* does not have white spots nor streaks on the chin and throat.

Patrick's pair seemed to be a true pair, they refused to be vocal in my presence but I thought I heard a difference between the contact note. The voice is very similar indeed to that of *leucosticta*. It would be invaluable to be able to make comparative observations in song and breeding behaviour. One of the pair was slightly more richly coloured.

Munia enthusiasts might recall that in my notes on the Black-rumped Munia *L. leucogastroides* I included a comparative sketch

showing three different munias that can easily be confused by the trade. In addition to the Black-rumped I showed a White-rumped *L. striata* and a White-bellied Munia *L. leucogastra*. I am not writing in any detail about this latter species in these notes, because I've not been able to obtain any specimens at all so far. However my friend Patrick Tay managed to select one from a shipment of mixed munias from Indonesia early in 1988. I was able to examine this bird in the hand and make some detailed colour sketches and measurements. The sketch with these notes can be compared with my one of the nominate race from Malaysia in the aforementioned article, and also with Goodwin's drawing. You may think they are three different species, and I mention it here to dramatise that the White-bellied is a fairly variable species. The sketch here is of the race *castanonota* (Fig 18).



Fig 18: White-bellied Munia *Lonchura leucogastra castanonota*.

THE FIVE-COLOURED MUNIA *L. quinticolor* is regularly imported these days and has now been bred several times in Britain. It is a pretty bird, distinguished by the white shaft streaks on the ear-coverts, noticeable even on the immature (Fig 19). It is usually imported with Indonesian Java Maja Munias *L. ferruginosa* (now usually grandiosely called Lombok Munias in the trade.) The juveniles are virtually identical but can be separated by the ear-coverts. In addition, careful examination of the head feathers will usually show

an odd dark feather – also indicating *quinticolor*. The reason for including this munia in my notes on rare munias is that there is a form with golden rump and uppertail-coverts. In the three shipments I'm aware of *all* the birds in the shipment were golden rumped. This suggests it is a distinct race from the normal reddish-chestnut-rumped bird. Goodwin describes the bird as “. . . Rump, uppertail-coverts and the wide fringes of the pointed central tail feathers, deep reddish golden to bright, light golden . . .” This suggests a variability within a given population, but with all respect to my friend and munia mentor I have a strong suspicion that the golden-rumped morph is a distinct race. When in Singapore recently I was able to examine a major shipment of finches from the island of Timor. There were several thousand birds of three species – the Timor Sparrow, the Timor Zebra Finch, and the golden-rumped *L. quinticolor*. I selected a handful of typical specimens and made a detailed colour sketch of one. I was able to compare it to the “normal” chestnut-rumped form.

To my enlightenment the differences were multiple, and not merely a question of rump colour. Here are my comparison notes:

Chestnut-rump

Average length: 110 – 115mm

Top of head & nape: dark brown

Ear coverts: chestnut with whitish-quill striations

Bib and throat: very dark brown

Rump and uppertail-coverts: chestnut with reddish gloss

Breast and flanks: white or cream

Golden-rump

– 120 – 125mm

– dark reddish-brown with grey v-markings

– orange chestnut with pink quill striations

– chestnut

– straw, with golden gloss

– pure white with white glossy edges to the feathers giving unique silken vermiculated effect in side light.

Side by side, the two birds appear to be almost different species, but I'd settle for a sub-specific recognition. Obviously, serious field work needs to be carried out.

I have discussed this at length on several occasions with a dealer in Singapore who specialises in Indonesian birds. He confirms my analysis that, very rarely, he does come across a batch of *quinticolor* in which every bird has the rump and uppertail golden. I have now

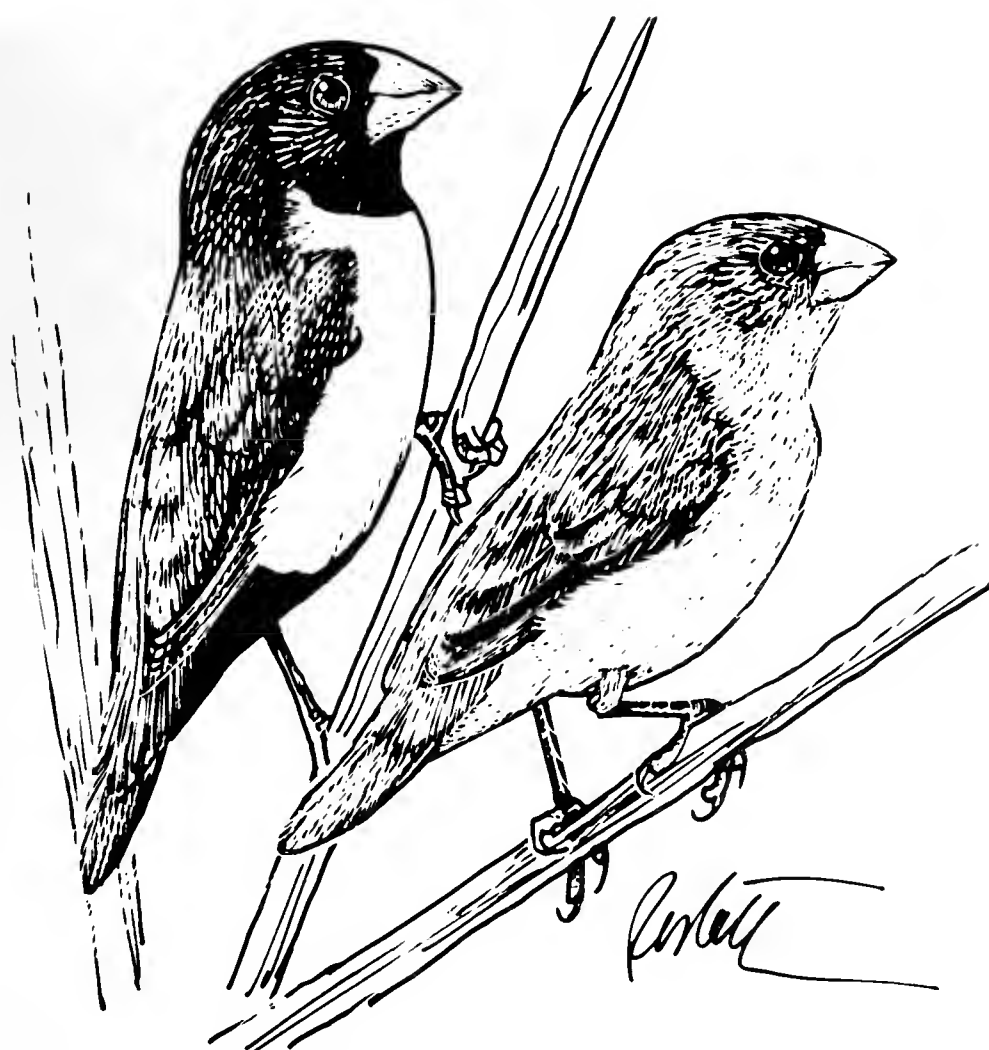


Fig 19: Five-coloured Munia *Lonchura quincolor* Adult (left) and juvenile (right).

seen maybe a dozen shipments of these birds in Jakarta and Singapore, but to my disappointment every single bird has had a dark reddish-chestnut rump.

THE GRAND VALLEY MUNIA *L. teerinki* has been imported just once to my knowledge. A few dozen came from Indonesia and were advertised as Black-breasted Munias. I took five of them, two males and three females. One young female died in the changeable autumn weather of 1988, leaving me with two pairs. One pair was very active in nest-building throughout the late summer and autumn of 1988, the others never came into breeding condition although they were very fit.

It is a small, rounded or cobby munia, about 100mm long (Fig 20). The adult has the face, throat and centre of the breast, heels and undertail-coverts black. The upperparts are brown with the uppertail-coverts straw-coloured. The lower breast, belly and flanks are white. There is an irregular line running from the centre breast down the flanks. It is very distinctive and is a certain diagnostic. This line down the flanks tends to be continuous in the adult male, and broken in the female. It is not pure black; there is a touch of cinnamon at the side of

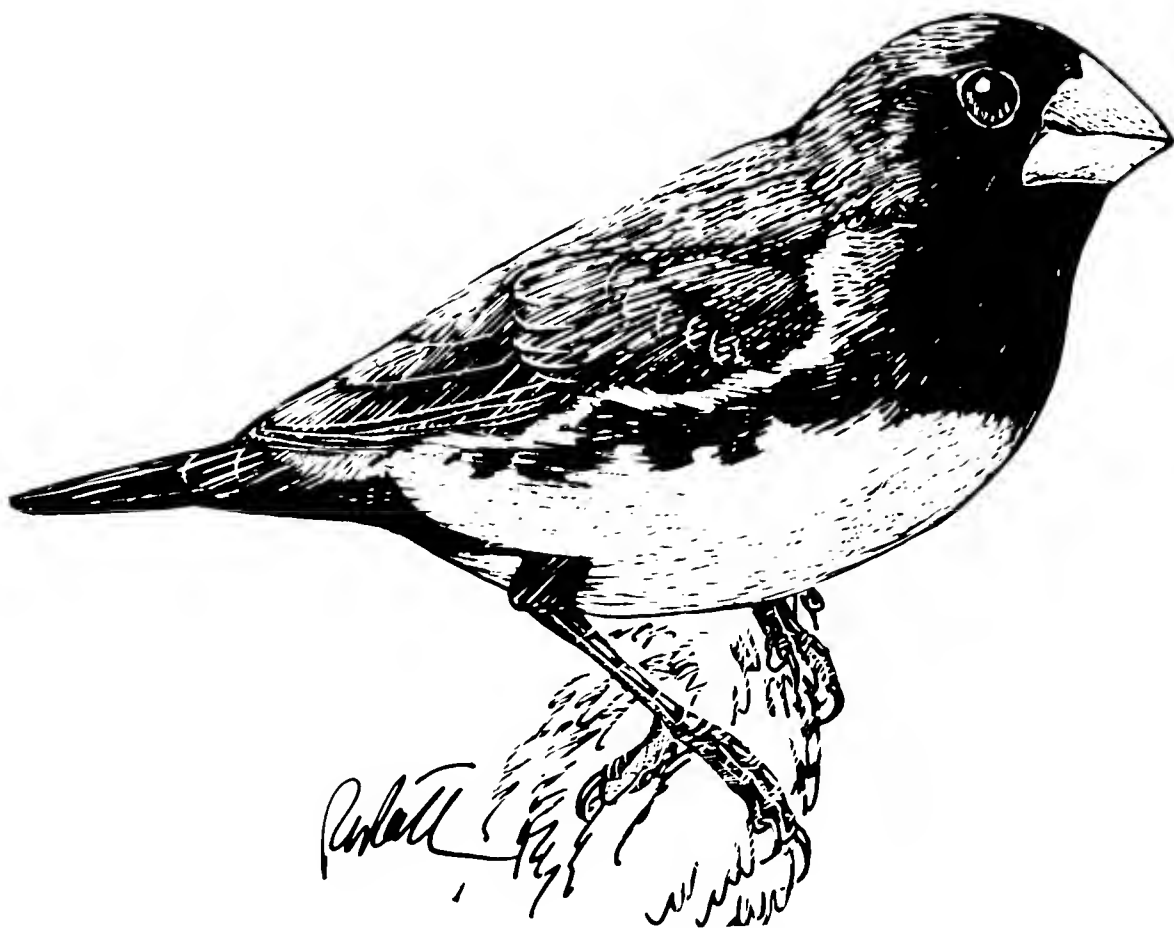


Fig 20: Adult male Grand Valley Munia *Lonchura teerinki*.

the breast and small patches of this among the black of the flank line. When a bonded true pair are seen side by side the male can be seen to be blacker on the face and breast, and the line down the flanks unbroken. In contrast the female is a little browner on the face and the line on the flanks is broken. The bill is pale grey and the legs and feet blackish. Young males in first adult plumage are very difficult to tell from females. I would hesitate to predict the sex of a single bird.

This delightful and unusual munia is found only in the Grand Valley area of the Snow Mountains of West Irian Jaya, and is said to favour man-made grasslands, gardens and weedy growth. There is one population in the north, *L.t. teerinki* as described above (this is the race imported) and several populations of another race *L.t. maria* on the southern slopes, reportedly more intense black on the head and richer deeper brown above.

I have found it an easy species to cater for, they will take all manner of seeds and enjoy millet on the spray. They show a distinct preference for vertical and angled perching like every munia I have had from New Guinea (and many others) and will prefer to work their way up a vertical perch than fly from one horizontal perch to another. Similarly they will alight on a suspended branch hanging downwards rather than a horizontal perch. They chirrup more like sparrows than my other munias. They are very sociable, roosting

together in warm corners, beneath some overhanging ferns, or high under the eaves. The pairs roost touching each other, often in a nest basket. Whilst they have shown a great deal of interest in the hay-filled tenements and baskets, I've never seen them show the slightest interest in nest-boxes, not those with holes nor any of the many half-open front variants I have around the birdroom.

The male has a quiet typical munia song that he utters with little ceremony, only slightly fluffed and slightly stretched. It is concluded when the female crouches slightly, twisted a little towards him. However, I have not seen attempted copulation and suspect this is not full intensity display. I run a daylight neon tube for 13 hours every day, year round, which is essential for tropical birds in my opinion. This means of course that our winter with its long nights does not have a significant effect on the bio-rhythms of my birds. It is quite possible that I might see some successful breeding between sending these notes to our editor, and seeing their publication. If so I will certainly send some follow up notes.

Well that concludes my current notes on rare munias. I hope it will inspire those few enthusiasts who have attempted to breed (maybe successfully?) some of these species to write their own notes and send them to the editor. I will happily collaborate with any sketches or comments if required. I'm also perfectly willing to collate short notes from different aviculturists into one digest.

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CORRESPONDENCE

Breeding of Grey-cheeked Parrots Brotogeris pyrrhopterus

In November 1985 I managed to obtain nine Grey-cheeked Parrots from Customs and Excise. They were kept together in a large cage for the rest of the winter and in the spring of 1986 they were put into a large aviary with six nest-boxes. In November of that year one young bird was bred and left the nest, but after a few days, due to the cold winter, it died. They did not go to nest again in 1987 or 1988 but this year (1989) I was surprised when inspecting the nest-boxes that three young were in one of them. The first of these left the nest in the middle of July and a week later the other two also came out. They were exactly the same as their parents except that they had black beaks and their colours were duller. Both parents went into the nest together to feed, and I found that when the young came out of the nest, they stayed with their parents all the time although they were in a colony.

While this is not a first breeding, as Mr. W. Lewis bred them first in 1925, they have as far as I can find out, not bred in this country since, according to Rosemary Low in her article in the *Avicultural Magazine*, Vol. 93, No. 4 (1987), they were bred at Loro Parque, but have seldom been bred in Europe.

When I had my nine birds sexed in 1987 I found that I had seven females and two males, and according to other people who have these birds in their collections, there is a shortage of males. I have found the birds hardy and have only lost two during the time I have had them.

According to J.M. Forshaw (*Parrots of the World*) the length of these birds is 20cm. The birds are distributed in South America, West of the Andes, from Chone River District, Western Ecuador, South Piura and extreme North-West Peru.

K.W. Dolton, Worcester.

* * *

Winter food of feral Ring-necked Parrakeets

I wondered for a long time what these birds (presumably *Psittacula krameri*) fed on during the winter. It is alas only too clear what they eat during part of the year. They are a destructive pest to anybody who tries to grown apples. Later they seem to feed in high hawthorn hedges.

When my attention was first drawn to them, 15 or more years ago,

they were winter feeding on bird tables in the Weybridge area, but it was difficult to believe that this was the sole source of food. Apart from anything else their numbers would seem to have overwhelmed the hospitality even of the good burghers of Weybridge. It has been possible to count between 30 and 40 birds in the air at one time.

The observation by members of my family that they were feeding systematically on horse-chestnut *Aesculus hippocastanum* buds may indicate that they will eat a wide variety of plant food.

S.B. Kendall, Surrey.

* * *

New Parrot species discovered in Ecuador and Peru

How many bird species unknown and un-named by man have been lost in the tropics due to deforestation in recent years? The answer to this question will never be known. Who could have foreseen that two new Parrot species would be discovered in 1985? One of these could have been a victim of deforestation.

In the early part of 1986 I received a letter from Robert Ridgely with the exciting news that he had discovered a new species of *Pyrrhura* conure in south-western Ecuador. He wrote: "Its population is surely very small and its forest habitat is getting cut from under it. The new species is part of the *P. melanura* complex but stands apart in several important field characters."

In the first issue of *Parrotletter*, the newsletter and journal of the ICBP/SSC Parrot Specialist Group, there is a brief report on a small expedition to Ecuador which took place in August 1987. Its purpose was to begin the process of conserving the still un-named conure.

On the first day of field work two flocks totalling 18 birds were observed feeding in scattered fruit trees in a heavily cut-over valley. This sighting extended the range of this *Pyrrhura* by 100km north of the discovery site. It alleviated concern that its population might be limited solely to the El Oro Province. However, the remaining habitat appeared to be decreasing quickly near Naranjal with 50 per cent of the forest having been cleared for cattle.

Five sites were checked along the Andes at the Conure's preferred elevation; all were devoid of this species or, indeed of any small Parrots except Celestial Parrotlets *Forpus coelestis*.

Parrotletter reported: "After three weeks of dodging landslides, camping at elevations up to 4,000 metres, and descending freshly cut roads without brakes, the survey team returned to Quito having confirmed that Ridgely's conure was indeed a unique and isolated

species. It appears to occupy a very narrow elevation band between 600m and 1,200m in the cloud forest." The bird prefers the moist forested slopes which are enveloped by mist and fog daily.

This species has been formally named the El Oro Parrakeet *Pyrrhura orcesi*.

The second new species was discovered in Peru. Dr. Charles Munn repeatedly observed and photographed a small green Parrotlet unlike any previously described. There were five individuals. Dr. Munn was working for Wildlife Conservation International, a division of New York Zoological Society. The following year his study site was 30km further downstream on the Manu and he and his Peruvian assistants repeatedly observed flocks of a dozen or more of the same species feeding on the fruits of *Coussapoa* (fig family).

Having become familiar with their vocalisations, Dr. Munn has since seen and heard this species in many parts of the Manu River basin. It appears to be a *Nannopsittaca*, a genus of which only one species was previously known, the Tepui Parrotlet *N. panychlora*. The latter has yellow around the eye but is otherwise green with a dusky bill. Length is about 5½in. (14cm). The new species is bright green with powder-blue forecrown and flesh coloured bill.

In 1987 it was observed in a previously unexplored region of Peru, near the Brazilian border, feeding on bamboo seeds.

Rosemary Low, Gran Canaria, Spain.

* * *

Response of Stella's Lorikeets to Pomegranate

My pair of melanistic phase Stella's Lorikeets *Charmosyna papou stellae*, which is housed indoors in a flight cage, is routinely fed a selection of fruit together with the usual nectar mixture. Most favoured are grapes and apple, with lesser enthusiasm being shown for tomato, pear and banana. The birds will not touch orange. Recently, slices of pomegranate were offered for the first time. Both birds showed immediate interest, more especially in the rind rather than in the fruity seeds. The birds began to chew into the rind, presumably extracting a small amount of fluid, and proceeded to "ant" with the juice, spreading it throughout their plumage with jerky movements and over their feet. This behaviour continued for as long as 10 to 15 minutes after the introduction of the fruit, always using the juice from the rind only. At no time were any of the more extreme postures associated with anting in other species observed. Between the application of each mouthful of juice the feathers were shaken

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vigorously. By the following day all traces of the fruit had gone, having been eaten by the birds. This behaviour has always been observed whenever pomegranate is offered.

Subsequent to this observation pomegranate has been offered to two pairs of Goldie's Lorikeets *Trichoglossus goldiei* and to a pair of Yellow-backed Chattering Lories *Lorius garrulus flavopalliatu*s. None of these birds have ever shown any unusual interest in the fruit.

Eric Callaghan, Co. Dublin.

AVICULTURAL SOCIETY NEWS

A Council Meeting was held on Saturday, 21st October, 1989, at 10.30 a.m. at Warren Hill, Hartley Wintney, Hampshire.

Mr. Nigel Hewston and Dr. Roger Wilkinson were elected to serve as Council members.

Mr. David Alderton and Mr. Malcolm Ellis were re-elected to serve another term of office as Council members.

The following awards were made for the first breeding in Britain of the species listed below, no prior claims having been established:

The Society's Medal

Collared Sunbird *Anthreptes collaris* by Mr. A. Ridd, in 1987.

Blue and White Flycatcher *Cyanoptila cyanomelaena* by Mr. J. Trollope, in 1988.

The Society's Certificate of Merit

Double-banded Sandgrouse *Pterocles bicinctus* by S.A. Hinsley and D.J. Hockey, University of Wales, 1988.

The autumn Social Meeting which followed at 12.30 p.m. was well attended by some 60 members and their guests. After a buffet lunch, members were given a very interesting talk, "An Avicultural Trip to Australia" by Mr. W. Painter, illustrated by many excellent slides.

Social Programme for 1990

Dates for your diary – details of each event will be circulated, either by an insert in an appropriate issue of the magazine or, if time does not allow, by notices sent to members who have asked to be on the mailing list (see subscription renewal leaflet).

24th March – Spring Social Meeting – lunch and lecture at the Society's headquarters, Warren Hill, Hartley Wintney.

5th May – Visit to Chester Zoo, by kind invitation of Dr. R. Wilkinson, Curator of Birds.

2nd September – President's Garden Party, at Chestnut Lodge, Cobham, Surrey, by kind invitation of Miss Ruth Ezra and Mr. Raymond Sawyer.

13th October – Autumn social meeting – as spring meeting.

It is hoped to arrange at least one other visit next summer.

Hon. Secretary.

AMERICAN PHEASANT AND WATERFOWL SOCIETY. You are invited to join the Society and receive ten issues of the Society's magazine yearly. Informative and interesting to people rearing waterfowl, pheasants and miscellaneous birds. Deals with incubation, diseases, and other factors in rearing birds. Annual Dues: 25 US dollars. Lloyd R. Ure, Secretary/Treasurer, Route 1, Granton, Wis., 54436, USA.

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The Editor does not accept responsibility for opinions expressed in articles, notes, reviews or correspondence

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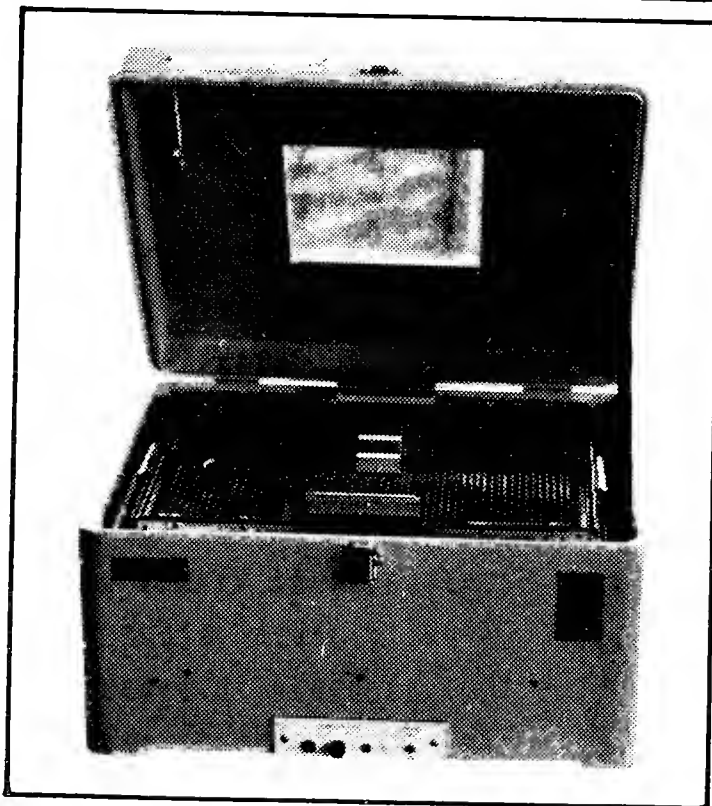
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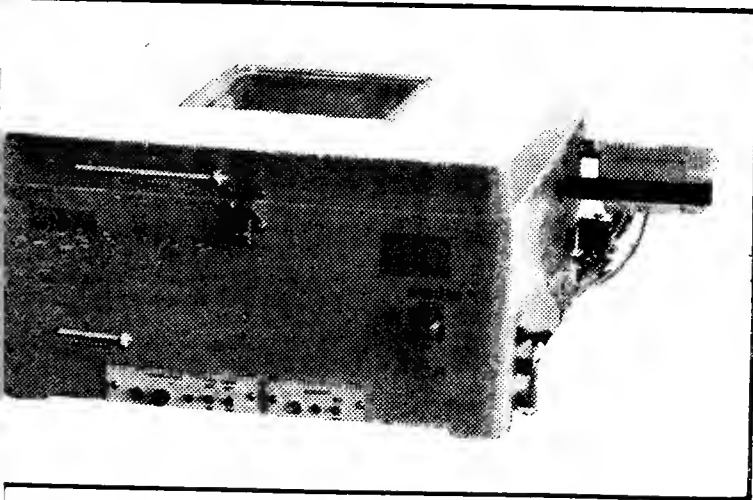
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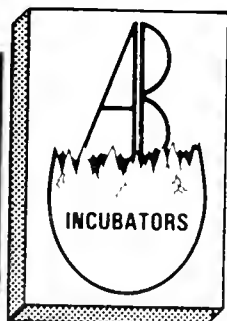


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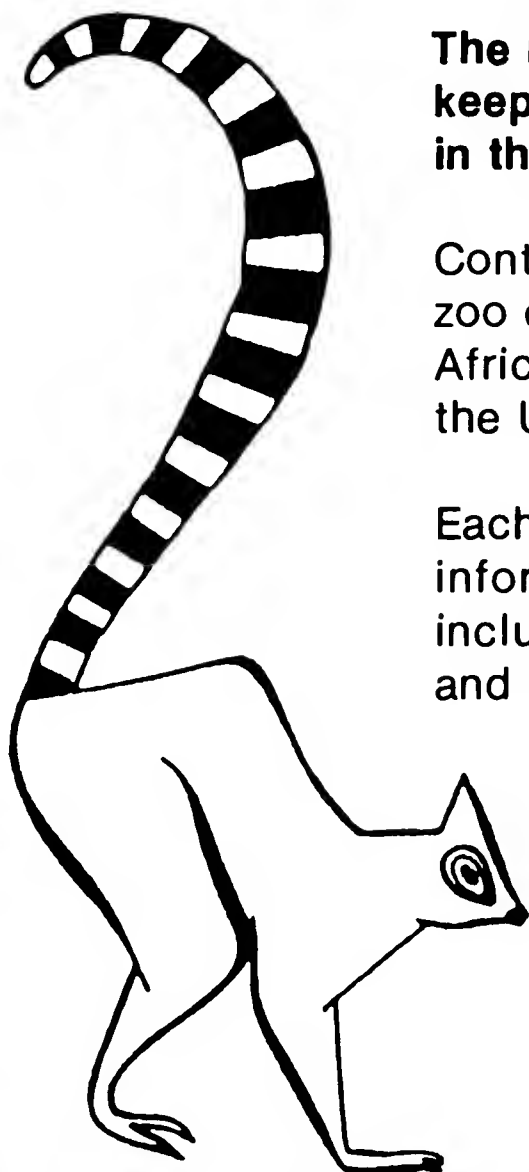
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ADDRESS OF EDITOR

Mary Harvey, Honorary Editor, The Avicultural Magazine, Warren Hill, Hulford's Lane, Hartley Wintney, Hampshire RG27 8AG, England.



Brown-hooded Kingfisher, two months old. First captive hatching in the world at Cincinnati Zoo in June 1988.

David Oehler

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SUCCESSFUL PROPAGATION OF THREE *HALCYON* KINGFISHER SPECIES

H.s.smyrnensis, *H.a.albiventris* and *H.c.cinnamomina* at the CINCINNATI ZOO, (OHIO, USA)

By DAVID A. OEHLER

(Cincinnati Zoo & Botanical Gardens, Ohio, USA)

Introduction

The Cincinnati Zoo and Botanical Gardens acquired three species of *Halcyon*; White-breasted Kingfisher *Halcyon s. smyrnensis*, Brown-hooded Kingfisher *H.a. albiventris* and the Micronesian Kingfisher *H.c. cinnamomina*. Due to the situation on the island of Guam, information was available for the propagation of the Micronesian species but parameters had not been sufficiently produced as to minimal cage size, proper diet and nest-sites for *Halcyons* in general. A variety of food such as live insects, fish and other small vertebrates provided the kingfisher with the suitable nutritional need for proper egg production and rearing of young. Cage size and proper nest-sites also had to be determined. The materials used for the nest-sites had to be stable enough not to collapse during excavation yet could not be too hard thus discouraging the nesting pair. Flight space of approximately 11.m³, with perching placed 1.5m \pm .5m from the nest/log/bank proved to be sufficiently large enough to allow flights into the nest material and excavation of the nest-site.

By using observations from each species, propagation of all three proved successful. At the time of writing, 12 White-breasted Kingfishers, 3 Brown-hooded Kingfishers and 3 Micronesian Kingfishers have been produced at our facility.

The genus *Halcyon* contains a group of inland Kingfishers set apart by a comparatively broad, stout bill and long legs (Hanzak, 1965). They vary in colour from black to blue or green, and from rust to black-brown. The beak is black, brown, or red, and sometimes bicoloured (Grzimek, 1973).

WHITE-BREASTED KINGFISHER

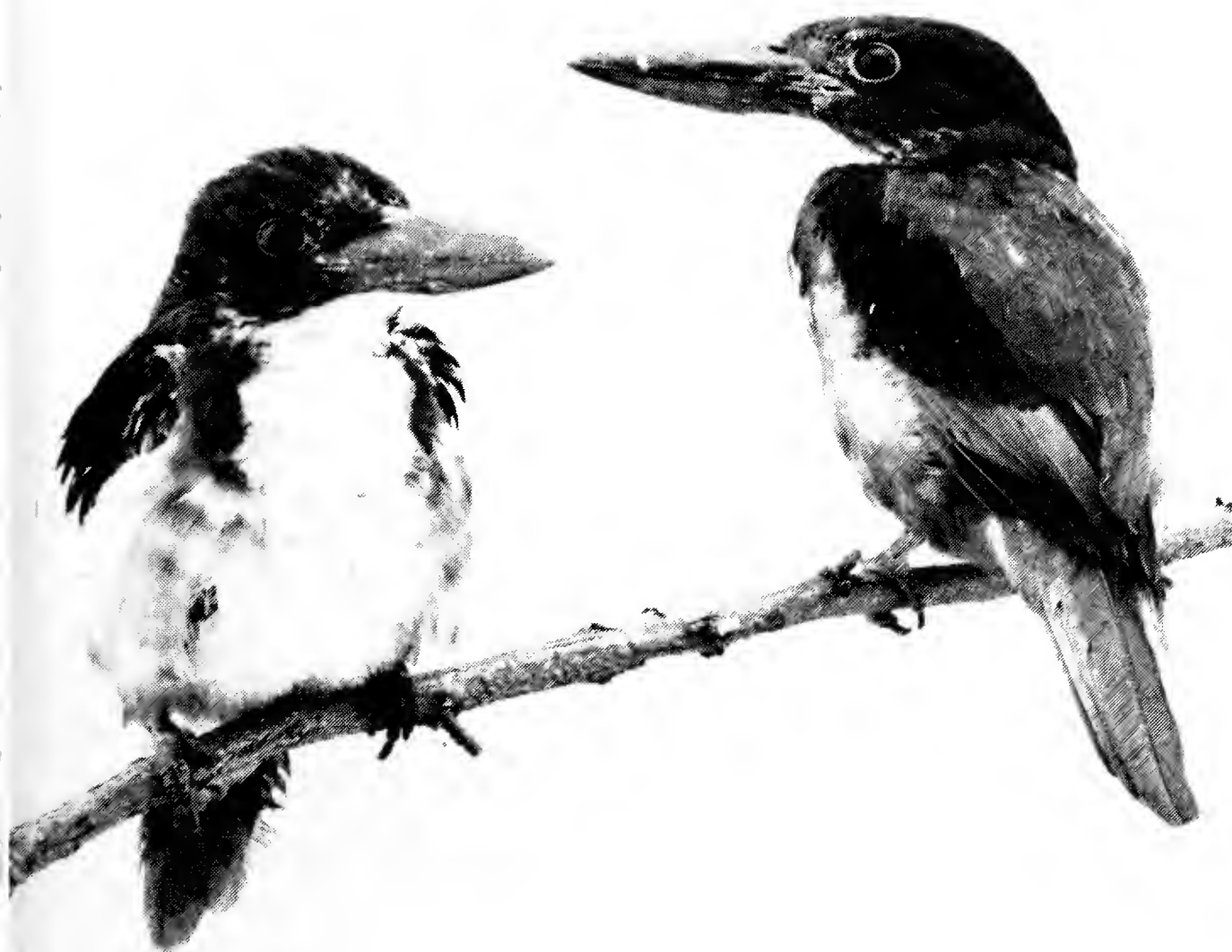
Found throughout Asia minor to southeast Asia the White-breasted Kingfisher *Halcyon s. smyrnensis* has striking visual characteristics. The chin, throat and centre of the breast is white, the bib of the male being 30% larger than the female's. Chocolate brown covers the head and remaining underparts, accented with turquoise blue primary-coverts. Less dependent on water than some of its counterparts, one can find this bird in deciduous forests some distance from open water, or on open rice fields. A noisy and conspicuous bird, the White-breasted Kingfisher is a common sight on telegraph wires or leafless branches that it uses as a vantage point to hunt large insects, fish, frogs, reptiles, small mammals and even small birds (Forshaw, 1985a).

These birds lay a clutch of glossy white, rounded eggs in an excavated burrow. These burrows are usually made along the side bank of a stream or ditch. The burrows have been found to slope upward with a 70mm diameter and are from 50cm to a metre in length. Both parents have been observed sharing incubation and care of the eggs and chicks (Forshaw, 1985a).

The Frankfurt Zoo bred this species using a clay bank. The parents shared incubation duties and fed to the young small fish, cockroaches, maggots, and soft food (Grzimek, 1973).

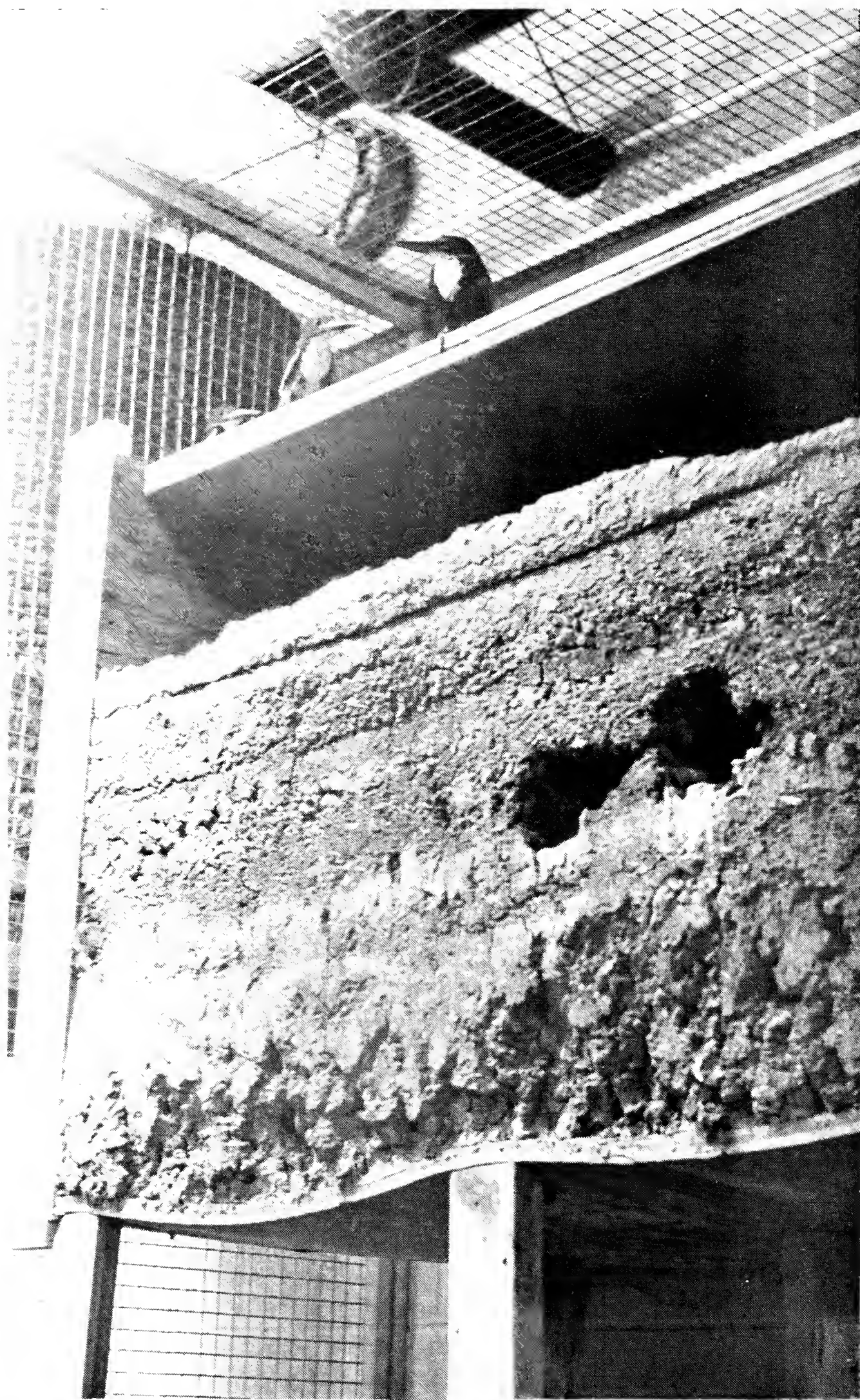
The Cincinnati Zoo acquired a pair of White-breasted Kingfishers in January, 1987. Their enclosure consisted of an off-exhibit aviary 2.2m \times 2.3m \times 3.0m in height. Perches measuring .5cm to 3cm in diameter were placed in the top corners of the aviary at a distance of 1.5m from the face of the nest-box. The open-faced box was constructed of plywood measuring 1.3m \times .7m \times 1.0m high filled with clay, top soil, sand and sphagnum moss to simulate a mud bank. The top of the box had a 3.0cm lip to allow water to collect. The top panel was perforated with 1mm holes to enable the water to seep down into the box in order to keep the contents moist. This artificial mud bank was mounted 1.5m above the ground in the rear of the enclosure. A diet of goldfish, minnows, mice, mealworms, fly larvae, waxworms and crickets was offered throughout the day. A fifteen-hour photoperiod for the cage was controlled manually with the use of a timer.

Seven tunnels were excavated between September and December. A tunnel 51cm in length was used and an additional two weeks were spent completing the nest-chamber. The tunnel diverged to the right at a 20° angle, thus no direct line of sight to the next chamber was



White-breasted Kingfishers (juveniles) at Cincinnati Zoo (first captive hatchings in Western Hemisphere).

available. Throughout January 1988, the pair took turns in manning the cavity. On 1st February vocalisations from the cavity indicated at least one successful hatching. On 6th February, three empty shells were removed from the chamber by the adults. Twenty-six days after the vocalisations were heard, the first juvenile emerged from the nest. Within the next three days the remaining two chicks also fledged. In March several eggs were found broken inside the display and periodical nesting attempts continued for three weeks. On 27th May the mud bank was reconstructed and excavation of a tunnel began within 10 days. While this tunnel was also diverged to the side, we were able to see inside clearly enough to detect five eggs on 24th June. The first two hatchings were observed on 11th July, plus an additional two by 13th July. Further excavations of the nest chamber continued until the chicks were moved out of the line of sight from the entrance of the tunnel, making further observations impossible. Five chicks hatched and were fledged by 2nd August, 1988. To date, a total of 12 offspring have been produced.



Male White-breasted Kingfisher with two juveniles, above nest-bank.

David Oehler

BROWN-HOODED KINGFISHER

The Brown-hooded Kingfisher *Halcyon a. albiventris* inhabits wooded and savannah country near rivers throughout Kenya and Tanzania to Central Africa (Williams, 1985).

The Brown-hooded Kingfisher is aptly named due to a greyish-brown nape and forehead, shaft streaked with a brownish black. This bird spends much of its time on fenceposts, protruding branches and telegraph wires waiting for prey to appear on the ground below. This prey consists mainly of large insects along with frogs, small reptiles and, occasionally, fish. Nesting occurs in burrows excavated by the birds in an earth bank. These burrows have been noted to slope upwards for approximately 45cm and then turn to one side (Forshaw, 1985b). A clutch of eggs, averaging four in number, is deposited in the nest chamber (Mackworth-Praed, 1957).

A pair of wild-caught Brown-hooded Kingfishers was acquired by the Cincinnati Zoo in January 1987. These two birds were placed in a public display measuring 2.7m \times 1.5m \times 2.7m in height. Perching in the form of three mulberry trees 0.5–2m from the nest cavity was provided. The pair was placed on a diet consisting mainly of crickets, mealworms and waxworms with supplemental feedings of small vertebrates. A nest-box was mounted outside the display measuring 0.2m \times 0.4m \times 0.5m high. The chamber was filled with a moist mixture of top soil, sand and sphagnum moss. The box was connected to the display with a tube 4cm long with a diameter of 7cm, on 6th May, 1988.

Excavation of the nest-site began two days after the nest-box was provided for the pair. By the end of May, activity going in and out of the nest site had discontinued. On opening the nest-chamber we found three eggs, apparently abandoned by the female. The eggs were taken for artificial incubation.

The three eggs were incubated at 99.5°F dry bulb and 86°F wet bulb. Two of the eggs were fertile and hatched on 18th & 19th June, 1988. These eggs were noted to have shells thinner than those found in our other kingfishers. The chicks weighed 7.0gr and 6.7gr respectively. The chicks were fed diced, newborn mice warmed in Pedialyte and given vitamin supplements in the form of Necton-S. The temperature was kept at 99.5°F for 24 hours, then lowered first to 97.5° for the next seven days, then continuing to decrease as the birds matured. Both chicks began to form pellets at four days old and fledged at 25 days old. At the time of fledging both birds were feeding on mealworms, crickets, anoles and fish.

Modifications were made on the nest-box making it deeper by adding a $0.2\text{m} \times 0.3\text{m} \times 0.3\text{m}$ high extension on the top posterior portion of the box. This made the total length 0.7m in which the pair could tunnel.

While the hand-rearing of the two Brown-hooded chicks continued, the adult pair began to excavate a new tunnel on 7th June, 1988. Adjustments in the diet of increased amounts of minnows, goldfish and anoles were made. On 22nd June nesting began with the female producing three eggs. These eggs had denser shells than the eggs produced previously. The first evidence of a successful hatch appeared on 16th July when vocalisations could be heard from the nest-chamber. One chick that had died was thrown out of the nest, and later we learned another of the remaining two had also died. The third chick appeared outside the nest on 11th August and was soon feeding on its own.

MICRONESIAN KINGFISHER

The male Micronesian Kingfisher *Halcyon c. cinnamomina*, with its greenish-blue black and cinnamon head and breast and black banding from the lores to ear-covert differs from the female which has a buff white upper breast and throat (Forshaw, 1985c). This kingfisher was endemic to the island of Guam before its extermination due to the introduction of the Brown Tree Snake, *Boiga irregularis*. This secretive species feeds mainly on large insects and was found nesting in holes of trees excavated by the pairs. Additional nest-sites have been found in decaying standing wood, arboreal termitaria or tree fern roots. (Marshall, 1989). U.S. zoos have bred the Micronesian Kingfisher using deciduous logs far enough into decay that the log itself was crumbling (Shelton, 1986). The density of wild nests were evaluated by taking the mean of 10 penetrations by a 12.5cm long ice pick into the nest tree in the vicinity of the excavation with a single pushing motion. The penetrability of nest trees was $7.4\text{cm} \pm 1.8\text{cm}$, this was greater than that of live trees which was $1.0\text{cm} \pm .4\text{cm}$ (Marshall, 1989).

The pair of Micronesian Kingfishers that the Cincinnati Zoo received in 1986 was a pair of birds which had each been captured in the same area, leading us to believe that the birds could have been previously pair-bonded. The birds were placed in an off-exhibit aviary measuring $2.2\text{m} \times 4.6\text{m} \times 3.0\text{m}$ in height, of which this pair used only $2.2\text{m} \times 2.3\text{m}$ area for the majority of time. A palm log



Brown-hooded Kingfisher in exhibit at Cincinnati Zoo.

David Oehler

measuring 1m long and 0.8m in diameter was placed in the upper corner of the cage. The epidermal covering was removed from the face of the log. Perching was placed throughout the cage starting at approximately 2m away from the log. Later the perch 2m from the log would be used as the point from which to dive into the log for excavation. By using the method described by Marshall, measurements of penetration were taken on the palm logs used. While the vascular cylinder was softer (measurements of $8\text{cm} \pm 1.0\text{cm}$ were taken), the outer surface of the logs was vastly harder.

Measurements of $2.5 \pm 1.0\text{cm}$ were taken in the cortex that these birds were found to excavate. While this method was not absolute, relative density had been concluded to be greater than the nest-sites measured on Guam.

After four tunnels were excavated, the pair began to incubate two eggs in April, 1987. The one chick that hatched died on 13th May, 1987. A second clutch of eggs proved unsuccessful with the pair having their eggs roll out of the nest through a connecting tunnel. A third clutch of two eggs was observed in the nest chamber on 24th June, 1987. Two chicks had hatched; one on 17th July, the other on 19th July. While no observations of the chicks were made at that time, evidence in the form of two perfectly pipped egg shells discarded on the aviary floor told of their presence. Both parents shared in the care of the young. Using the perch 2m away from the log once used to excavate the nest-site, one bird would call announcing its presence. As one bird flew to the nest with food, the other would depart. Only one bird did survive to fledging; the other carcass remained in the nest cavity.

Discussion

All three species exhibited similar behaviour in courtship, nesting and rearing of young. A basic formula could then be developed and applied to other pairs of *Halcyons*. Minimal cage size of 11m^3 needs to be provided. Perching 1m to 2m from nest site should be offered for excavation of the nest-cavity and for food transference.

Whether the particular species uses trees or mud banks for nesting should be researched and the appropriate nest-site provided. The depth of the bank or log needs to be approximately 0.75m in depth to provide the adequate length of tunnels for security. The theory that a low density material was necessary in which tunnel excavation could take place proved untrue. These animals can enter materials relatively harder than once believed. Nest-sites should be replaced each season to stimulate courtship and breeding. Offering a variety of live

foods for the rearing of young will help ensure success. By working with several species representing one genus, patterns can be developed to further reproductive success. When time and the numbers of birds are limited, this method not only seems practical but imperative. The use of two common species; the White-breasted Kingfisher and the Brown-hooded Kingfisher led to a further propagation of the highly endangered Micronesian Kingfisher at our institution.

Acknowledgement

I would like to acknowledge the keepers of the Bird House at the Cincinnati Zoo and Botanical Gardens for their care of the *Halcyon* collection and their offspring. The breeding of the White-breasted Kingfishers was the first in the U.S.A. and the breeding of the Brown-hooded Kingfishers was the first in captivity. Couple this with the successful propagation of the Micronesian Kingfisher and they should indeed be proud of their efforts.

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BREEDING THE NEW ZEALAND SACRED KINGFISHER
(Halcyon sancta)
at WELLINGTON ZOO, (New Zealand)

By R. GOUDSWAARD
(Senior Birdkeeper)

The Sacred Kingfisher *Halcyon sancta* is a forest kingfisher sub family Daceloninae as opposed to the fishing kingfishers, sub family Alcedininae. Its range extends from Australia through Norfolk and Lord Howe Islands to New Zealand and as far as New Caledonia and the Loyalty Islands. The New Zealand subspecies *H.s.vagans* is found throughout New Zealand and on most outlying islands.

It is one of the more colourful New Zealand birds. The upper parts are predominantly a mixture of reflective blue and green, the colour appearing to change with the light, and the underparts vary from reddish buff to white. Males tend to have more buff on the underparts. There is a black band below the eyes, encircling the neck with an irregular white band below it. A fine white eyebrow adds character to the face and the upturned corners of the kookaburra-type beak add charm to what is already a delightful little bird.

Unfortunately, it is not really suited to aviary living. Even the Zoo-bred young are perpetually "flighty". At the slightest sign of an intrusion into the aviary they try to escape by flying into or on to the netting walls. Even more unfortunate for wild kingfishers, they seem to be naturally predisposed to flying into things, especially windows. Most years we have concussed or injured kingfishers brought into the Zoo for nursing. We seem to receive more injured kingfishers per head of wild population than any other species of birds. For example, in the last five years we have received twenty weak or injured kingfishers. I am sure we are not alone in this respect. Many appear to be young birds and, as expected, most are brought in during the winter, when the kingfishers have migrated out of the forest and into the suburban gardens. In my search through the records for the past ten years, I could not find a single record of a kingfisher that had been handed in to the Zoo in spring.

Tragically, at least 50% never recover enough to feed. Most of those that do recover are released but it does mean that there is always a regular supply of kingfishers available to put on display. Surprisingly, in contrast with the above, kingfishers survive quite well in aviaries, even in quite small aviaries, except that they do not breed

*Wellington Zoo*

Young female Sacred Kingfisher at Wellington Zoo, November 1989.

readily. Of all the dozens of institutions in Australasia that must hold healthy kingfishers from time to time, only two have reported successful breedings in the International Zoo Year Books. Both these reports seemed largely to involve individual pairs that were successful for only a limited number of seasons. One institution was the Taronga Park Zoo in Sydney which reared four kingfishers from 1982 to 1983, the one in 1983 being a second generation hatching. The other was the Otorohanga Kiwi Centre, where eight were raised between 1980 and 1982. My enquiries also revealed that Auckland Zoo had a pair of kingfishers in a mixed native bird aviary that attempted breeding several years ago but the three chicks died prior to fledging. The Head Keeper, Mick Sibley, thought the failure could be due to keeper interference although our own experience tends to point towards inadequate feeding. When our pair had three half-grown chicks the daily food intake was phenomenal. The food provided, as recorded in the Bird Run diary for the 17th November 1987, is as follows –

- 8.00 a.m. kingfishers given 3 small huhu grubs, 1 dozen earthworms, $\frac{1}{2}$ dozen mealworms.
- 8.30 a.m. 2 earthworms left, given 17 newborn mice and 10 moths.
- 11.00 a.m. given 100 mealworm pupae, 20 earthworms, 3 huhu grubs.
- 12.00 given 40 pieces of oxheart, 3 huhu grubs, 30 earthworms.
- 1.30 p.m. given 40 pieces of oxheart, 3 huhu grubs, 20 earthworms.

Previous earthworms still there and 20 pieces of oxheart from midday feed removed. i.e. can give larger mice, earthworms not so popular.

Less than a week later they were consuming 40 young mice per day!

These three kingfisher chicks did fledge. In subsequent clutches, when we were less lavish with the food, one or more chicks died, usually when they were half to three-quarters grown, which corresponds with the time of their maximum food requirements.

A study of wild kingfishers made in the Orongorongo River Valley, near Wellington, between 1972 and 1982 showed a direct correlation between nesting and the emergence of the Chorus Cicada *Amphipsalta zelandica*. The Chorus Cicada is a large insect 27mm long which emerges from the ground into its adult form in summer and is relished by many insect-eating birds. It survives by weight of numbers. It is my own pet theory that the only reason why the Long-tailed Cuckoo migrates all the way from the tropics to New Zealand to breed is to cash in on the cicada boom each summer. These cicadas are big, juicy, easy to catch, and are in their highest numbers in the tall timber forests that the Long-tailed Cuckoos most like to frequent.

The outcome of this is that the kingfishers in the Orongorongos were quite late nesting. When they did attempt to breed earlier the nest failed, and if they did nest at the correct time there was seldom time to rear a second clutch. In the Zoo our pair nested twice both seasons, presumably because ample food was provided early in the season.

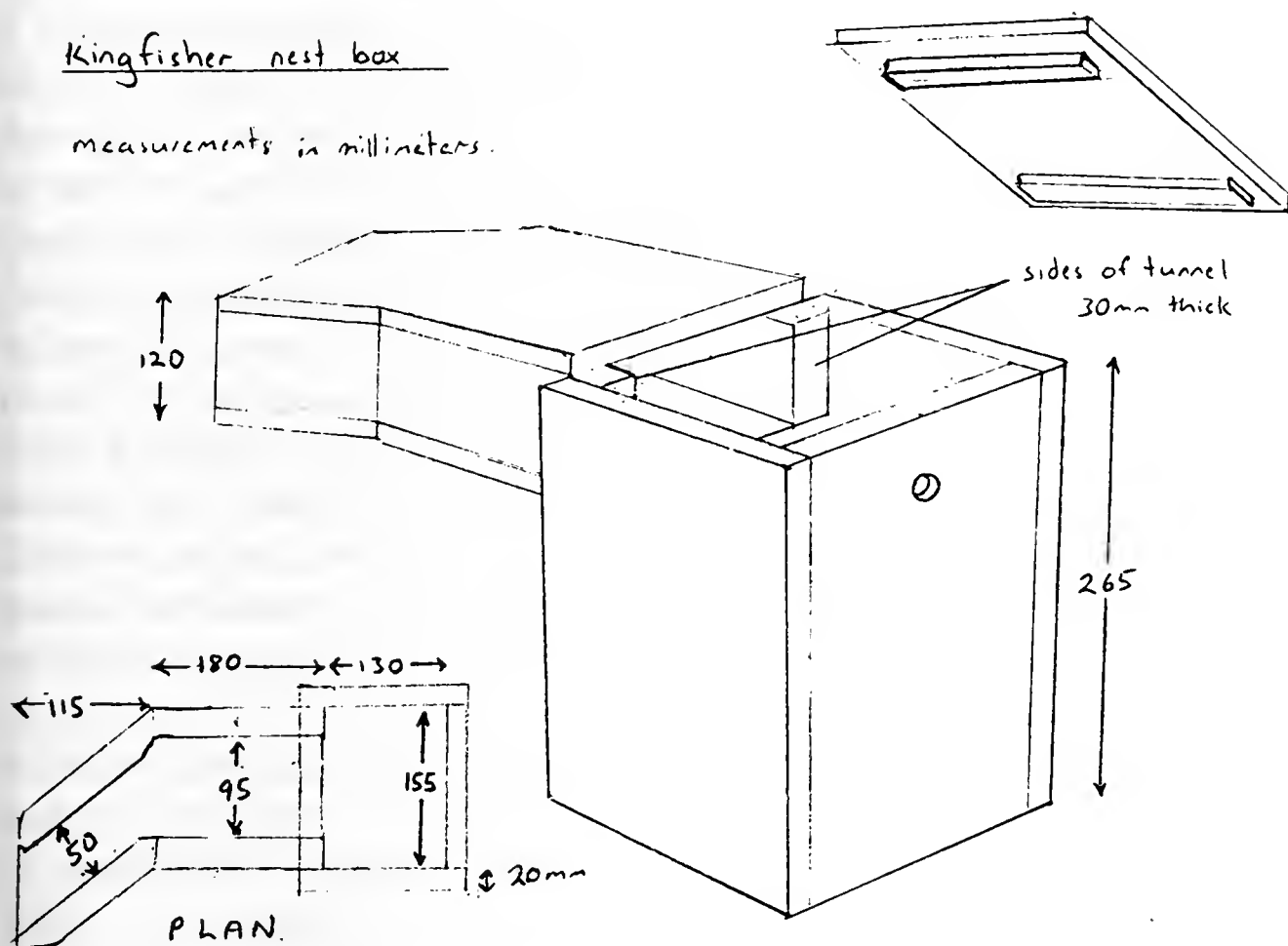
Another hindrance to captive breeding seems to be the birds' "flightiness" which has already been touched on. One of our parent birds was one of the chicks bred at Otorohanga and the other was hand-reared as a chick by a woman in Christchurch. Both of these

came to us from Orana Park in Christchurch. I then learned that the breeding pair of kingfishers at Otorohanga had also been handreared orphans! Mick Sibley, however, reports the Auckland Zoo birds were wild-caught.

A suitable nest site may also be a factor. In the wild the kingfishers will tunnel into clay banks or trees. At Orana Park no nest-box was provided and although eggs were laid there was no attempt to nest. At Auckland Zoo the kingfishers burrowed into the ground. At Otorohanga the kingfishers were provided with a tall nest-box, filled with rotten wood and fixed horizontally on the aviary framework, the birds tunnelling into the rotten wood. In later years, they tunnelled into rotten logs. At Wellington Zoo I built a nest-box specially for them. The only wild nest I had seen close up had been in a big old

Kingfisher nest box

measurements in millimeters.



Kingfisher nest-box used at Wellington Zoo (measurements in mm).

tree stump. The nest was less than 2m off the ground and readily accessible in that the stump stood exposed in a paddock. I remembered, though, that the entry tunnel was quite long and narrow, too small for my young hand at the time. From that I deduced the birds would not mind if the nest looked conspicuous, provided it had a secure entry tunnel. The next problem was that I could not put a long tunnel on to a small box without it becoming front heavy. I resolved to keep the tunnel less than half a metre long and instead began to worry if the kingfishers would dive into the tunnel at speed and hit the back wall of the box with a crunch. I tried to solve the problem by putting a slight kink into the tunnel against which the birds would slide and hopefully slow down before hitting the back wall.

The kingfishers were received from Orana Park on 5th February 1987. The nest-box was given to them in early spring, on 25th August, and the following day the kingfishers spent all day sitting on the box, or around it. Eighteen days later, on 13th September, the female was reported as being out of sight and exactly one month after that she was deemed to be sitting in earnest, i.e. she was out of sight all day.

The aviary is what we call our "Stilt Aviary". It measures 9.7m \times 4.9m wide and 2.4m high. The front half of the aviary is dominated by a wide, shallow pool 4.5m in diameter. Behind the pool is an oak tree. The nest-box was hung on the netting wall above the oak tree so that as the oak came into leaf the box would be hidden from view. The box was also placed here because it was the point farthest away from the service paths used by the keeper. In fact it is the only part of the aviary that a keeper does not pass through during the daily servicing. Perching was provided over the pond and under a small shelter roof at the back of the aviary. The food dishes were placed within reach of the perch at the back. The aviary was landscaped with mounds of fine sand and scattered carex grass to simulate a beach scene. Normal residents of the aviary were four Pied Stilts, a Greater Knot and a young Spur-winged Plover.

The aviary at Auckland Zoo, although taller, occupied a similar volume and that at Otorohanga was positively huge, the largest walk-through aviary in New Zealand, some 49m high. The aviary at Orana Park was approximately 6m \times 6m \times 2.5m high.

The birds were fed a basic diet of coarsely minced oxheart and premix. The oxheart is the basic diet for kiwis in captivity and the premix is a vitamin and mineral supplement, specially formulated to make the oxheart a complete diet. This was the same as a diet provided for the kingfishers at Otorohanga. Because of the size of the aviary at Otorohanga the kingfishers were able to forage for addition-

al live food. For example in 1984 the Tuis *Prosthemadera novaeseelandiae* bred in the large aviary and appeared to raise their chicks almost entirely on passion vine hoppers which were abundant at the time. At Wellington, the kingfishers were given live food once or twice a week to bring them into breeding condition. Geoff Moon in his book "Refocus on New Zealand Birds", reported trying to hand-rear young kingfishers on shredded beef, only to have the chicks weaken until he added small crabs to the diet.

Incubation is given by Geoff Moon as only 18 days although chicks were not heard until 15th November. The volume of live food being supplied was increased at the end of the month and on 4th November the male was seen carrying food into the box even though the female was off the nest feeding. From 13th November it became very hard to keep up with the demand for live food. Normally the adults are given a small dish of meat once a day. Now the dish seemed to empty between feeds, even when we were feeding five times a day. The volume at each feed was increased as per the records quoted at the beginning of the article.

On the 19th the male was seen to catch a small mouse which he bashed repeatedly before taking it into the nest-box. When he came out again he was carrying faecal sacs in his beak.

There is a danger when feeding young mice in bulk that the chicks may not be receiving enough calcium because of poor ossification in the young mice and we endeavoured to provide adult skinks. Even though these were the Common Skinks *Leiopisma nigriplantare*, it always seemed a crime to feed skinks as food and they were always given sparingly, and only in the last two weeks prior to fledging. The skinks were caught by laying milk bottles or tins, baited with a little honey water at the bottom, on sloping ground, under cover, in areas that skinks were known to frequent. Sometimes there would be three or four skinks caught in one bottle in one day, although quite often none would be caught. Gravid females were always released again.

The youngsters were due to fledge on the 26th, assuming the first had hatched on 1st November, but it was not until 4 p.m. on 2nd December 1987 that the first was found out of the nest. It could fly well but its feet were caked with white faecal(?) matter. The second fledged half an hour later, also with caked feet and the decision was made to remove all three for cleaning. The nest-box had been lined with clay to represent a natural clay tunnel and this had obviously been a mistake. At this stage the chicks could be aged by the amount of pin feathers still remaining on the forehead. After the chicks had been cleaned they had to be kept in the brooder room overnight to

dry out.

The chicks proved too nervous to hand-feed and the next morning they were returned to the parents' aviary. The male was obviously very pleased to see them and promptly started feeding them with baby mice. The youngest seemed unable to reach the high perch at the back and the male went down to the ground to feed it. At one stage the Plover approached the chick and made a jab at it. The chick responded by opening its beak and wings in a defensive-threat display and the Plover moved off. The chick was then lifted on to the perch at the back, next to its brothers and out of harm's way. The chicks were brought inside for the next two nights because of inclement weather and had their first night outside on 5th December.

Within two weeks the female was nesting again. Everything proceeded smoothly until 4th January 1988 when it was noticed that the male was driving the young birds off all his favourite perches. The following day the male was even harder on them and the young birds had to be removed from the aviary. One was already thin and weak, requiring hospitalisation, and one had disappeared without a trace. To this day we don't know whether it died or escaped. They are such swift fliers that on several occasions one or the other of the adults has darted through the open door as the keeper has entered the adjoining aviary, often without the keeper being aware of it. For this reason, keepers are taught to be particularly careful with the outside door to the aviary. Fortunately the adults know where the adjoining door is and are easily herded back.

The weaker chick died two days later and the Veterinarian diagnosed thrush as a result of stress. The stronger chick was started on a course of Mycostatin but it too died on 11th January.

Meanwhile the next clutch was due to hatch on 8th January and on the 22nd the box was checked to reveal one chick approximately 7cm high. The chick's pin feathers were forming and the eyes were just opening. The live food supply was maintained but on 31st January the chick was no longer heard vocalising although the parents still seemed to be in attendance. On 2nd February, when there was still no sound from the nest, the box was checked to reveal that the chick had died, probably a couple of days earlier. The chick had not been given any skinks or furred young mice, even though it was at the feather-growing stage and cause of death may have been a deficiency in calcium or silica for feather growth. The box was then removed for the winter.

On 7th September 1988 the box was returned to the same place and the parents were obviously excited to have it back. They became

very vocal. The normal territory call is a loud *kek kek kek* but during breeding they seem to communicate to each other with a quieter *kree kree kree* and later with a crooning noise which seems to arouse the chicks to beg. The chicks' begging call is quite a harsh sound, distinctive but hard to describe.

By 13th September the parents were seen going in and out of the box regularly and from 26th September the female was out of sight for most of the day. The chicks were due to hatch on 22nd October but even on the 27th there was no apparent movement of food to the box. On 2nd November chicks could be heard in the box and as soon as both parents came off the nest the box was inspected to reveal three chicks. Two chicks were about 65mm high, turning blue from the pin feathers under the skin. The third was smaller and still pink. The supply of live food was kept up but with more emphasis placed on the oxheart in case part of the previous problem was with the fledged youngsters not taking the artificial diet. When the nest was checked on 19th November one chick was dead, the youngest was missing and the third was starting to get rather dirty. The third was removed for cleaning and when he proved to hand-feed quite readily he was subsequently hand-reared. The nest-box was cleaned, relined with bark chips and sawdust and returned to the aviary.

The female was next reported sitting on 10th December and chicks were heard on 5th January 1989. A quick check revealed three chicks, three-quarters grown. The first fledged 18th January followed by the other two on the 21st. Unfortunately one was found the next day with a broken wing which our Veterinarian was forced to amputate; however, this bird died while still under hospital care. The remaining two were transferred to a small aviary next to the first young bird where a close eye could be kept on both of them.

All three are now together, fully accustomed to the oxheart/premix diet and doing well. They have coloured up and one of the second pair is quite different from the other two. The centre of her back is a dull olive brown, her shoulders are a duller blue than those of her mates and she has distinctive dark brown tips to her chest feathers. Her chest is also noticeably whiter than those of the males. Newly-fledged kingfishers have distinctive light barring on the chest.

The New Zealand race is supposed to be bigger than the Australian race and most books give a length of 240–250mm. This seems incredibly long when looking at a kingfisher in the field. Kingfishers are usually seen, particularly in winter, sitting hunched on a post or a telegraph wire waiting for something to move that they can pounce on. At these times they look only 120–130mm long. To check the

length the young female was caught up on 30th May; she measured 220mm stretched full length from bill tip to tail tip.

All the kingfishers had been weighed at various times for oral worming with Synanthic as part of a routine programme. On 15th February 1989 the young female weighed 65g and the two young males with her were both 70g. The parents were weighed on 21st February, the female being 70g and the male 64g. The three young fledged in 1987 weighed 62, 65 and 67g on 4th December 1987, and two males that were rehabilitated weighed 67 and 68g on 18th September 1987 just prior to release.

In conclusion, it would appear that in order to breed the Sacred Kingfisher the chances of success are increased with the use of captive or hand-reared birds and the provision of a tunnel box or rotten logs into which the birds can burrow. The birds must have access to natural food. Invertebrates are required for the first two weeks post hatching. Kingfishers appear to accept a wide variety of invertebrates. After two weeks the adults start rejecting invertebrates in favour of small vertebrates. In the wild kingfishers are known to take small birds. Our success with the last clutch would indicate that small furred mice are adequate, although skinks appear to be just as popular.

Post fledging it is probably advantageous to remove the young to a small aviary on their own where their food consumption, and in particular their acceptance of the artificial diet, can be monitored. The young birds have to be removed from the aviary as soon as the parents start breeding again anyway.

Unfortunately the rewards are small. The birds, parents and young alike, remain shy and flighty, spending much of their time towards the back of the aviary. When rearing young the food consumption is prodigious. At 40 mice a day it did not take long to deplete our own resources. I do not know why the Taronga Park birds stopped breeding but I did learn from Eric Fox, the Curator presently at Otorohanga, that the kingfishers were removed from the big aviary when they started attacking other nestlings. The kingfishers failed to nest in the smaller aviary into which they were moved, and because of the shyness they are no longer displayed at all.

For all that I still have a soft spot for them. They are beautiful to look at and I just love hearing their vocalisations.

ACKNOWLEDGEMENTS

I wish to sincerely thank Barry Rowe, formerly of Otorohanga, Eric Fox, Mick Sibley,

and Paul Garland, Director, Orana Park, for responding to my incessant questions. I would like to thank Kerry Muller for reading and suggesting improvements to my draft copy. And finally I would like to thank the Bird Section Keepers, and in particular Paul Barrett who recorded many of the observations described in this article and corrected any of my misconceptions.

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FOOD ITEMS PROVIDED TO KINGFISHERS
WITH CHICKS AT WELLINGTON ZOO

Food Item	Date of Nesting			
	Sept. 87	Dec. 87	Sept. 88	Dec. 88
Earthworms	*	*	*	*
Locusts	*	*	*	*
Moths	*	*	*	*
Mealworms	*		*	*
Mealworm Pupae	*	*	*	*
Crickets	*			
Huhugrubs	*			
Spiders			*	
Juvenile Wetas			*	
Grass grubs			*	
Ant pupae				*
Snails			*	
Pinkies (baby mice)	*	*	*	*
Fuzzies (baby mice)	*		*	*
Furred young mice	*		*	*
Skinks	*			

BREEDING THE CINNAMON-BREASTED BUNTING (*Emberiza tahapisi*)

By ERIC CALLAGHAN
(Co. Dublin)

This bunting is widely distributed throughout much of Africa. It is not brightly coloured, but quietly attractive nonetheless. The head of the cock is black, with a white stripe above the eye and two white stripes below the eye. The chin is blackish. The back is dark brown, while the breast is cinnamon, as the name suggests. The hen resembles the cock, but is generally duller.

A pair of these buntings was obtained during May 1986. They were in rather poor plumage, which much improved after the birds were placed outside in a 25ft (7.62m) flight, containing a mixed collection of seed-eating birds. Not surprisingly, the birds made no attempt to breed, being very quiet and inoffensive and keeping to themselves. The two birds tended to remain together. The cock was first heard to sing in September, the song being a fairly typical bunting type of song, characterised fairly accurately in *Roberts 'Birds of Southern Africa'* as "per-pe, pee-e-eter-cher". The birds were taken indoors at the end of October and housed in a large flight cage of 12' \times 18" \times 18" (3.66 \times 0.46 \times 0.46m), together with ten other small seedeaters. During the winter the hen laid an occasional egg on the floor of the cage. The eggs are dull white, heavily covered with reddish brown spots.

The buntings were released outside on the 5th April 1987, being placed in an aviary 10' \times 6' \times 6' (3.05 \times 1.83 \times 1.83m), together with five other pairs of seedeaters. On 20th April a small cup nest, built entirely of coconut fibre, was discovered on the edge of a clump of heather, about 3' (0.91m) from the ground. The following day the hen bunting was sitting on the nest. By now the cock was singing strongly, especially in the evenings. At no time was there any sign of aggression towards the other birds in the aviary, nor was there any of the vigorous sexual chasing seen in most bunting species. The hen sat on the nest for a period of about three weeks, but no eggs were laid.

Following a short break, the nest was tidied up with fresh fibre. The first egg was laid on the 13th May, followed by two more at daily intervals. Incubation began with the second egg. Contrary to *Roberts*, where it is stated that both sexes incubate, only the hen was ever seen on the nest. On two occasions during the incubation period the cock



Eric Callaghan

(above) Cinnamon-breasted Bunting chicks at five days old; (below) Newly-fledged Cinnamon-breasted Bunting.

was surprised apparently feeding the hen on the nest, although, as he was very shy and left the nest when approached, this could not be confirmed. Two young were present in the nest on the evening of the 26th May, the third egg hatching the following morning. This chick failed to compete with the older young and had disappeared the same evening. The newly-hatched young were flesh coloured with greyish down; the gape was red. A mixture of soaked canary and millet seeds, mixed with canary-rearing food was provided daily throughout the rearing period, in addition to the usual dry seed mixture. In addition approximately a dozen mealworms were provided daily, these proving popular with the Diamond Sparrows and Green Singing Finches which shared the aviary and not very many were available to the Buntings. From the beginning there was a clear difference in feeding habits between the sexes. The cock bunting was extremely interested in the mealworms and was always first to obtain some, whereas the hen seemed to have little or no interest in livefood, choosing preferentially to take the soaked seed/eggfood mixture. Neither showed any interest in greenfood.

At all stages of the breeding cycle the hen Bunting was tamer than the cock, always being willing to feed the nestlings while being observed from outside the aviary, a distance of just over 6 feet (2m). The cock, on the other hand, would initially 'freeze' upon being observed and then quickly slip away from the nest, even when, in the later stages, the hen would continue to feed the young while standing at his side. Unlike European buntings at no stage was food carried to the young in the bill, the nestlings, and later on the fledglings, always being fed from the crop, whether with seed or with livefood.

The hen had almost ceased to brood the young during the day by 3rd June and the two young left the nest on 10th June, at 15 days. Most of the postfledging care was carried out by the cock, with the young gradually achieving independence about two weeks later. The young generally resembled the hen on fledging, but the distinctive striping on the head was buffish rather than white.

The hen began to rebuild the nest on 14th June and the first egg of the second clutch was laid on 20th June, this clutch also consisting of three eggs. During the incubation of this clutch the two young developed the habit of sitting on the nest alongside the female. This habit did not produce any aggression from the adults. Possibly as a result of this habit only one of the three eggs hatched, the other two being addled. The young were removed from the aviary on the 27th June, six days before the chick hatched. The single chick only lived for three days. No further nesting attempt was made although the

cock continued to sing for some time.

All four Buntings were brought inside for the winter at the end of October and placed in the same flight cage as before, together with a number of other birds. Both young had fully moulted by this time, both proving to be hens. Within a few days of being caged the cock recommenced singing, presumably stimulated by the extended light period, the lights being on for a total of 13½ hours a day. Soon afterwards one of the young hens started to tear strips of newspaper from the floor of the cage. Eventually on 4th December, a nest was built in a rear corner of the cage, on the floor, using pieces of newspaper and some coconut fibre that was provided, a short length of dry heather having been pinned diagonally across the corner to form a foundation for the nest. One young hen appeared to be dominant over both the other hen and her mother, and carried out most of the nest-building, although all three hens were seen to carry nesting material. The birds were not at all shy, quite willing to build, even when observed from just outside the cage. At no stage was there any real aggression among the hens. On the 7th December there were three eggs in the nest. It soon became clear that more than one hen was laying, for two days later there were six eggs in the nest, with a seventh on the cage floor. The three new eggs in the nest were larger and lighter in colour than the first three. Three eggs were removed from the nest and a slide was introduced, shutting the dominant young hen in with the nest, whereupon she settled to incubate, showing no signs of distress at being separated from the others. All the eggs proved to be infertile. The sexes were then separated for the rest of the winter, to avoid further nesting attempts.

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THE BREEDING AND PARENT-REARING OF *EOS SQUAMATA OBIENSIS*, POPULARLY KNOWN AS WALLACE'S LORY

By DULCIE COOKE
(Epsom, Surrey)

That enchanting little bird known generally as Wallace's Lory has appeared at intervals in this country over many years; only to seemingly disappear and then emerge again, to be classified as "rare" by the importers. After much searching I have found no records of breeding during this time.

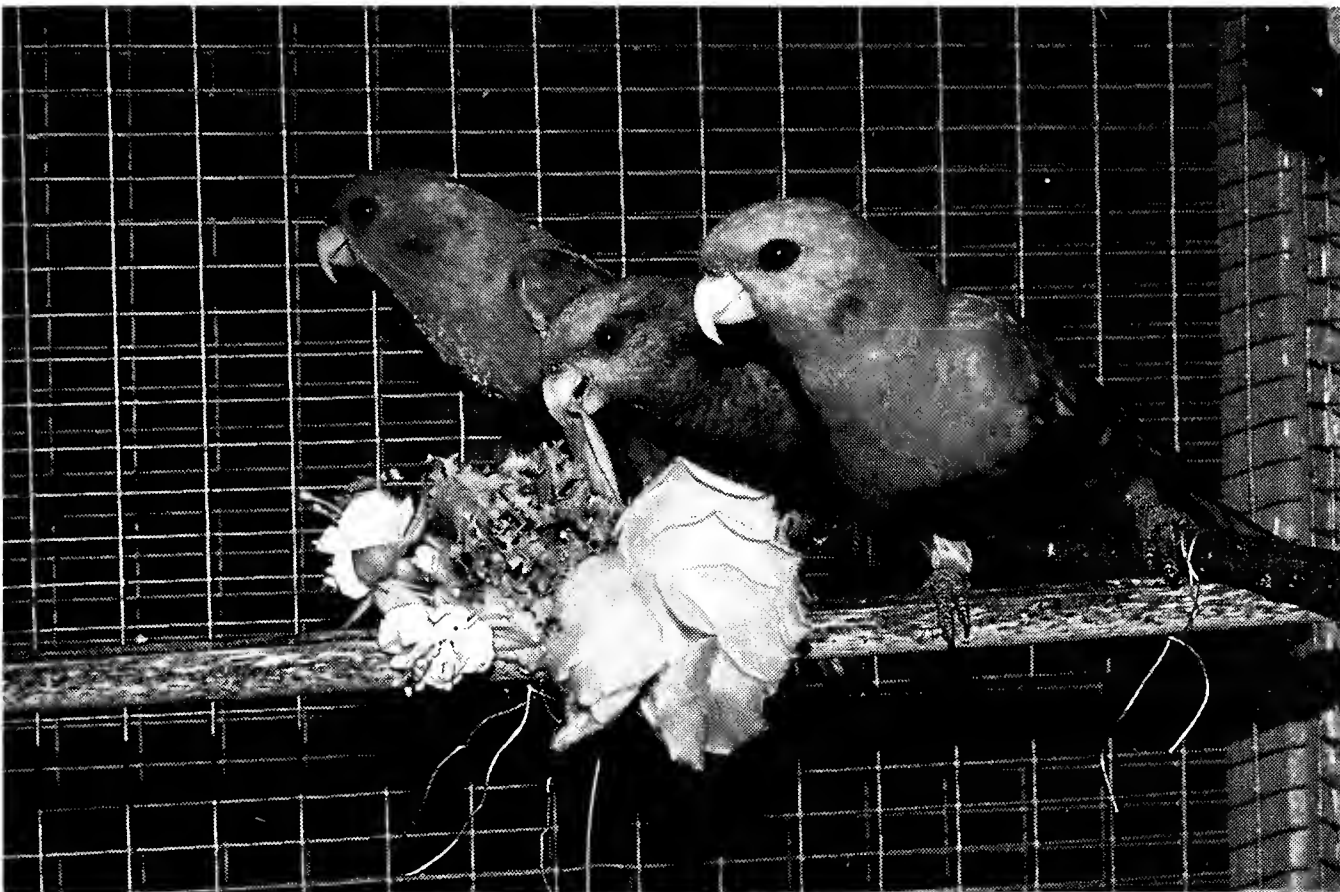
The year 1987-88 saw a considerable importation of these birds and I was fortunate in being able to see some dozens of them, both at the Importer's premises after quarantine and later at several commercial bird establishments. They were in such good condition that there was little or no soiling of their plumage and it was easy to see that there was some variation in their neck markings. In some birds these were entirely absent, in others quite pronounced.

The birds I have seen are as described by Rosemary Low in the Avicultural Society's Magazine (Vol. 95 No 1, 1989, page 45); where she refers to *Eos squamata obiensis*; (from the Island of Obi in the Isles of Maluku, Indonesia).

I would suggest that there are three features which help to identify these birds. As stated by Rosemary Low, the black scapular feathers, and also the very clearly defined areas of crimson and purple on the front of the bird, with no "smudging" of the area between the two colours, and the serrated scarlet line running across the black wing feathers.

My husband's and my two pairs of adult, surgically-sexed birds all weigh approximately 3½oz (100g) each, and their total length is approximately 9" (25cm). The whole of the head, neck, breast, back and rump, is bright crimson scarlet. The lower part of the breast and the abdomen right through to the vent is deep purple, in some birds so deep as to appear almost black. The flanks and upper parts of the legs are scarlet. The upper tail feathers are brownish red, sometimes with almost black edging to the end of the feathers; and the under tail feathers are brown.

The shoulders can have a brown appearance at times in the females I have seen, and in some of the younger males. This is absent in older males. I do not for one moment suggest that these birds are



Young Wallace's Lory with parents. September 1989.

Dulcie Cooke

dimorphic, but our two females, and others I have seen, have all had slightly orange coloured feathers at the base of the upper part of the leg (near the tarsus); in older males these are scarlet. The younger males can have a mixture of both colours.

The wing markings of these birds are particularly attractive, being clearly defined areas of red on the shoulder, set off by the black scapulars. The primaries are black, and these admirably display the pretty serrated scarlet line across the black secondary wing feathers.

The underside of the wings are a bright red, giving the birds a most attractive appearance when they display. On one of our adult males there is a small but distinct patch or quarter "collar" of dark purple at the back of the neck. This is absent in the other adult male. The eyes, which are not large are beautiful because of their dark brown colour and expressive appearance, portraying their very considerable intelligence. The beak is orange and the legs are grey. For ease of identification of the colouring, the accompanying sketch will perhaps be of assistance.

During the summer of 1988 my husband Freddie and I purchased our first surgically sexed pair. They had just been released from quarantine and were both in superb condition, their plumage unstained by the very liquid diet on which they had been kept. I have

noticed that whereas many species of lorries coming out of quarantine, although perfectly healthy, seem to have got themselves into a very messy state, these very tidy little birds are in excellent feather.

Our birds quickly acclimatised in the small, sheltered aviary we gave them and appeared right from the start to be happy and content, although understandably rather wild at first. This wildness lasted for several months; now they are some of the tamest and most trusting of our birds. Another surgically sexed pair bought later is behaving in exactly similar fashion to the first pair.

The aviary of the first pair consists of a "half-house" approximately 2' 6" (61cm) wide by 4' (122cm) long by 3' (1m) high with a flight 4' (122cm) wide by 6' (2m) long by 6' (2m) high. The floor and walls of the house are lined with Formica to make cleaning easier, and layers of newspaper, frequently renewed, with some wood shavings for extra warmth in winter make a good floor base. The house roof is interlined with insulating material 4" (10cm) thick. A low wattage electric light comes on at dusk and remains on all night, going off at daylight.

The floor of the flight is of ornamental stones laid 1/4" (.63cm) apart for ease of cleaning. The flight roof is covered with corrugated glass fibre transparent roofing material. During the coldest months of the year the whole of the front of the aviary flight is covered with thick P.V.C. sheeting so that it is completely protected from wind and rain, also, of course, snow. The whole of the floor during the winter of 1988-89 had about 2" (5cm) of wood shavings to protect the birds as much as possible from cold and damp coming from the stone floor.

The nest-box we provided is located in the flight. It is 8 1/2" x 8 1/2" x 17" deep. (21.5 x 21.5 x 43cm) with a 3" (7.5cm) diameter entrance hole, a doweling perch 3/4" (2cm) thick running through from outside to inside, a ladder, and an inspection door. A mixture of brown peat and wood shavings to a depth of 3" (7.5cm) provides the nesting material and for added warmth during the coldest months we added a 1" (2.54cm) layer of wood shavings on top of the peat mixture.

During their first week here these birds had taken, with obvious pleasure, to our dry food mix which is always accompanied by a cup of water very close at hand. When feeding lorries and lorrikeets a dry food mix, (even if, as in our case some nectar is also available) it is *absolutely essential* to ensure that the birds have water close by the dry food, so that they are encouraged to drink. This they do with great pleasure.

Our lories and lorrikeets all have varying quantities of nectar, made from the same materials as the dry food, fresh twice per day. Some of them like quite a lot, others only want a very small quantity. The birds about which I am writing, popularly known as Wallace's, are amongst those that only want about two tablespoonsful of nectar twice per day between the two of them, and even that small amount is not always consumed.

The dry food mix we give our birds varies from day to day, to give them as much variety as possible. It is always mixed up fresh each morning for the two feeds per day and consists of various Milupa baby foods such as the following: Milupa Autumn Fruit Harvest, Oat Breakfast with apple, 7 Cereal Breakfast, Mixed Fruit variety, Tropical Fruit, and Wheat Breakfast with honey. There are many others, but we do not give our birds any baby foods containing meats, fish, poultry or vegetables. Most of the vegetable varieties contain leek or onion, which we know from experience of hand-rearing other parrot species, can be most upsetting to delicate avian stomachs.

To these Milupa foods we add glucose, or occasionally cane sugar, brown ground rice, ground brown semolina (a kind of ground wheat), and ground oats, which the birds particularly enjoy. We make up the mixture in the proportion of half Milupa foods, one-eighth part glucose or cane sugar, and the other foods make up the whole quantity. To this we add a vitamin and mineral mix. There are many on the market, and many countries have a large selection from which to choose. Most of these tonics have a large proportion of Vitamin A, which is very important for lories and lorrikeets.

All the year round the birds are given either lettuce, endive or watercress, also flowers in bloom such as fuchsia, small flowered single begonias, the type used as bedding plants (*Begonia semper-florens*), honeysuckle, single roses, pansies, wallflowers, in fact any flower which contains nectar (not all do) and provides pollen, and which is not poisonous. We have been told by a bee keeper that the flowers, nectar, and pollen of rhododendons are *all* poisonous. We do not give our birds either daffodils or dahlias, but they are given, throughout the summer, the flowers of impatiens ("Busy Lizzies"); they are extremely fond of these brightly coloured flowers, especially the red ones, and we wonder if perhaps this has something to do with the bright red colour our birds have retained.

We soon discovered that these small lories are avid wood eaters. A small branch of willow about 18" (45.5cm) long containing the delectable green buds they crave so much will be devoured during one day, leaving only a stick with no bark, all the buds eaten, and the

leaves consigned to the floor. Our birds are given both willow, and apple, also hazel as often as possible during the winter months.

Right from the start of their introduction to dry food all our birds are accustomed to peeled apple, pear, and also peeled grapes; cut up finely and given fresh twice per day *on top* of the dry food. The quantities are small and a little glucose is sprinkled on top to encourage the birds in the early stages. Later this extra glucose can be left out and the fruit can be lightly shaken into the dry food mixture.

During March 1989 our first pair of Wallace's (*obiensis*) went to nest. They played a great deal, rather like puppies, rolling over and over on the perches and then the cock would blow himself up to his full height and puff out his feathers to make himself look larger. Mating always took place on a perch, never on the floor, in fact they seldom went on the floor except to bathe.

Two eggs were laid and about 23-24 days later two chicks were hatched. The parents looked after them with great care, until disaster struck one very cold night. We think either a cat or a fox frightened the parents badly and they must have left the nest and not returned. In the morning I found two very frightened and distressed parent birds and two babies dead, untouched in any way and with full crops. These wonderful little birds appeared to be absolutely heart-broken, and the little hen sat on the perch almost crying, her beautiful little eyes blinking. For some weeks it seemed as though nothing would console her, in spite of all the cock's attention and caresses.

Eventually on 16th May it was discovered that this same hen had laid again, two eggs as before, and on 6th June 1989 I found two strong little babies in the nest. Two days later one died, although there seemed to be no reason for its death. The other chick thrived and was well fed and tended by the parents. Photo transparencies of the chick and its parents were taken at intervals from a very early age, some show the baby in the nest with quills just appearing, others taken later present a charming picture of the parents watching the photo being taken (from the inspection door) by looking through their nest box entrance hole! The young bird was seen by Cyril Laubscher, and by June and Paul Bailey.

During the summer months the young one made steady progress, and by 6th July it was showing bright crimson on its head and crimson and black on the wings. Simon Joshua of Databird Worldwide Scientific Ltd chromosome sexed the young bird, and it proved to be a male. He came out of the nest on 8th August and was constantly fed by the parents. He returned to the nest to sleep with his parents at night.

In September the young male was gradually accustomed to spending the day in the adjoining aviary, one of similar size and type to that of his parents. He could feed himself by then during the day, but for some time returned to his parents each night, to be promptly pumped nearly to bursting point with food by his father and then to disappear into his parents' nest-box for the night. After about two weeks his mother clearly thought he should stay in his own aviary and he quickly became used to being shut in the half house for the night with its comfortable light giving out a very slight warmth.

By mid-October the young bird was almost the size of his parents, but of course slimmer. His colouring from the beginning had always been almost identical with the parents except for a rather "speckled" appearance on the breast and around the cheeks, due to some slight brown and purple "lacing" to the feathers with just one or two of a green appearance. Now in the autumn of 1989 this lacing is disappearing and he is gradually assuming full adult plumage.

These birds are obviously double brooded and are most excellent and attentive parents, displaying a quite touching concern about the well being of their offspring. Unfortunately a disproportionate number of cocks came into the country, but we hope very much that those owners who have one or more pairs of sexed birds will make every endeavour to breed from them. Hopefully then in due time sufficient numbers will be available to propagate healthy strains of these charming and confiding birds.

As described above, Wallace's Lory *Eos squamata obiensis* has been bred by Mr. and Mrs. F. Cooke and this is thought to be the first success in this country. Anyone who knows of a previous breeding in Great Britain or Northern Ireland, or of any other information that would disqualify this claim, is asked to write to the Hon. Secretary as soon as possible.

* * *

A SELECTION OF MYSTERY BIRDS

By Dr. KARL P.N. SHUKER
(West Bromwich, West Midlands)

The Congo Peacock *Afropavo congensis*, Imperial Pheasant *Lophura imperialis*, African Bay Owl *Phodilus prigoginei*, and Inaccessible Island Rail *Atlantisia rogersi* are just four of the many distinctive new species of bird discovered earlier this century. Moreover, further examples (including some very sizeable ones) are still being found each year, along with the not uncommon rediscovery of supposedly extinct species. Examples include the discovery in 1983 of a new albatross *Diomedea amsterdamensis*; a hitherto unknown pheasant *Lophura hatinhensis* found in Vietnam during 1964; also in 1986, the rediscovery of the plover-like Jerdon's Courser *Cursorius bitorquatus* in India, a species hitherto presumed extinct since 1900; and, most recently, the exciting reappearance of the magnificent Madagascan Serpent Eagle *Eutriorchis astur*, sighted alive and well in 1988 after many experts had written it off as extinct since 1930.

Less well known, however, is that dozens of other unusual bird forms have been reported over a similar period that continue to elude formal detection and identification by scientists. A number of these, furthermore, have the potential for becoming (if and when they are finally discovered) some of the most impressive ornithological finds in many decades. This article therefore sets out to recall and reveal a selection of some of the more interesting and potentially significant of these mystery birds, and also to point out that certain of them may have been allowed to slip into extinction without receiving due attention by science.

The New Guinea birds of paradise are among the most exotic and ethereal of all avian forms. Although 40 species are currently recognised, skins of additional, controversial forms have also been collected – and sometimes formally named. These include: *Paradisaea bloodi*, *P. maria*, *Cicinnurus goodfellowi*, *Parotia duivenbodei*, *Epimachus ellioti*, *Janthothorax bensbachi*, *Neoparadisaea ruysi*, and *Pseudastrapia lobata*. Yet in line with the pronouncement in 1930 by avian specialist Erwin Stresemann that 18 such types were merely hybrids, all of these (plus a further six types collected more recently) are nowadays denied formal status as separate species.

Although many of these mystery birds of paradise are unmistakably intermediate in appearance between certain pairs of genuine

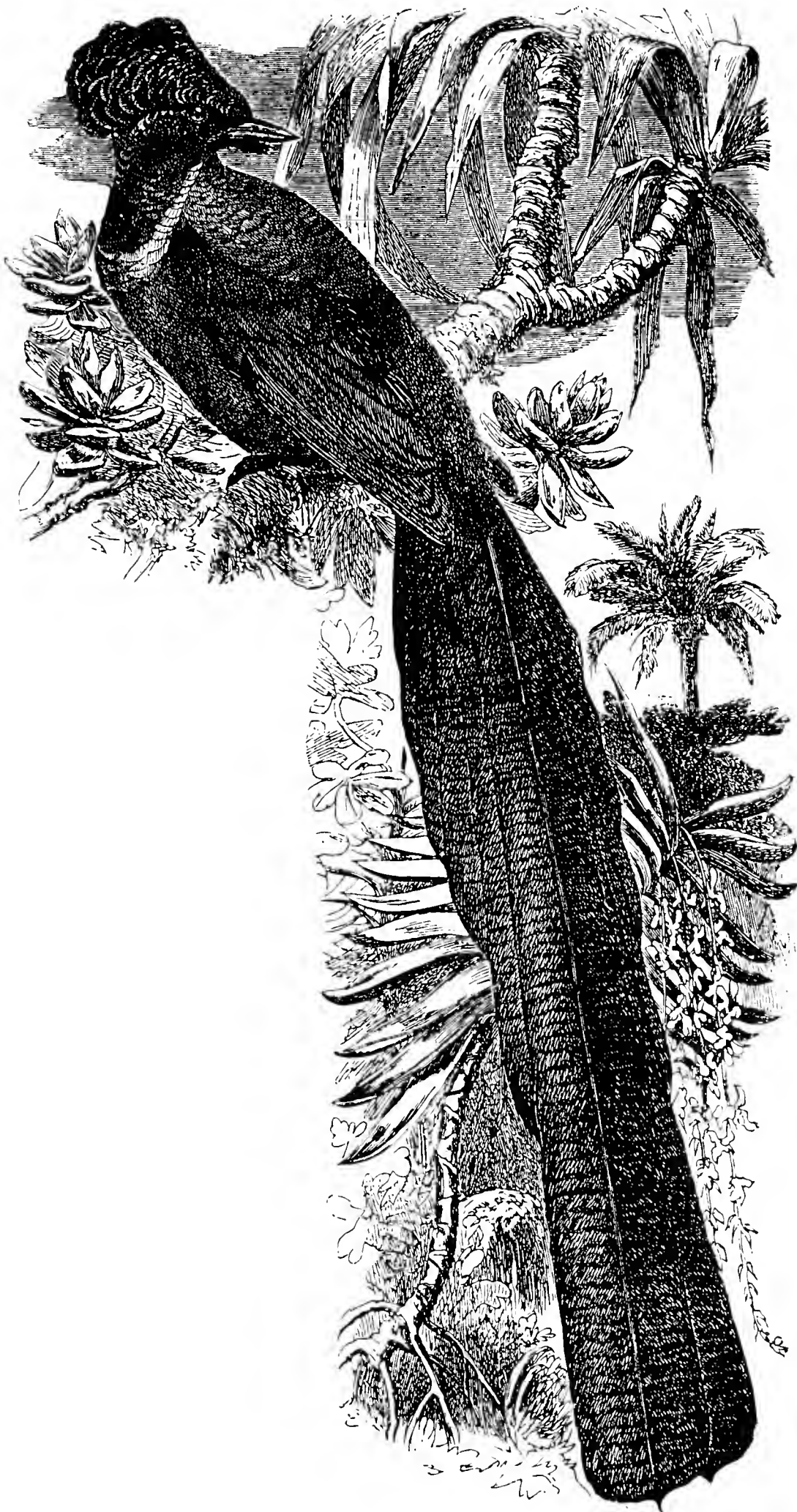


Fig 1: The Arfak Astrapia *Astrapia nigra*. A parent species of *Epimachus ellioti*?

species, there are also examples that defy ready classification as hybrids. One prime example from this latter category is Elliot's Sicklebill – a silky-plumed, long-tailed form that received the name *Epimachus ellioti* when first discovered, and whose claim for recognition as a valid species has recently been championed by Errol Fuller in his *Extinct Birds*. Stresemann had postulated that *E. ellioti* was the result of hybridisation between the Black Sicklebill *E. fastosus* and the Arfak Astrapia *Astrapia nigra*, but as Fuller has pointed out, in stark contrast to genuine hybrid forms *E. ellioti* exhibits a number of morphological features not possessed by either of its putative parental species. Most striking of these dissimilarities is its diminutive size – notably smaller than any accepted species of sicklebill or astrapia (in contrast, *bona fide* hybrids are often larger than both of their parental species).

Consequently, it is by no means inconceivable that *E. ellioti* is truly a distinct species. Moreover, the late bird of paradise expert Dr. Thomas Gilliard was optimistic that unrecognised new species did still exist in remote New Guinea localities. It should also be remembered that one of the most spectacular of all species, the Ribbon-tailed Bird of Paradise *Astrapia meyeri* (with a pair of white tail feathers measuring up to a yard in length!) was unknown to science until as recently as 1939.

Even more mysterious – being represented not by whole skins but instead by a single feather – is the Two-banded Argus Pheasant. In the 8th April, 1871 issue of *The Field*, T.W. Wood documented a remarkable feather, which, although superficially similar to plumes from the Great Argus Pheasant *Argusianus argus*, nonetheless differed from the latter in several important ways. One of the most significant of these was its possession of an elongated area of chocolate coloration dotted with white, which was present not only upon the broad web of the feather (as in corresponding wing primaries of *A. argus*) but also upon the narrow web. As a result of this, Wood christened its undescribed owner *Argus* [now *Argusianus*] *bipunctatus*. Since then, this mystery bird has been sought on several occasions in Java (presumed by some to be its provenance) by ornithologists, including the noted pheasant expert Jean Delacour, but no specimen has ever been located, thus inducing Delacour to predict that it was now most probably extinct.

His belief was reiterated in 1983 by G.W.H. Davison, writing in the British Ornithologists Club's *Bulletin*. Moreover, after closely examining the lone *A. bipunctatus* feather, he inferred from its markedly limp, flexible structure and certain other morphological

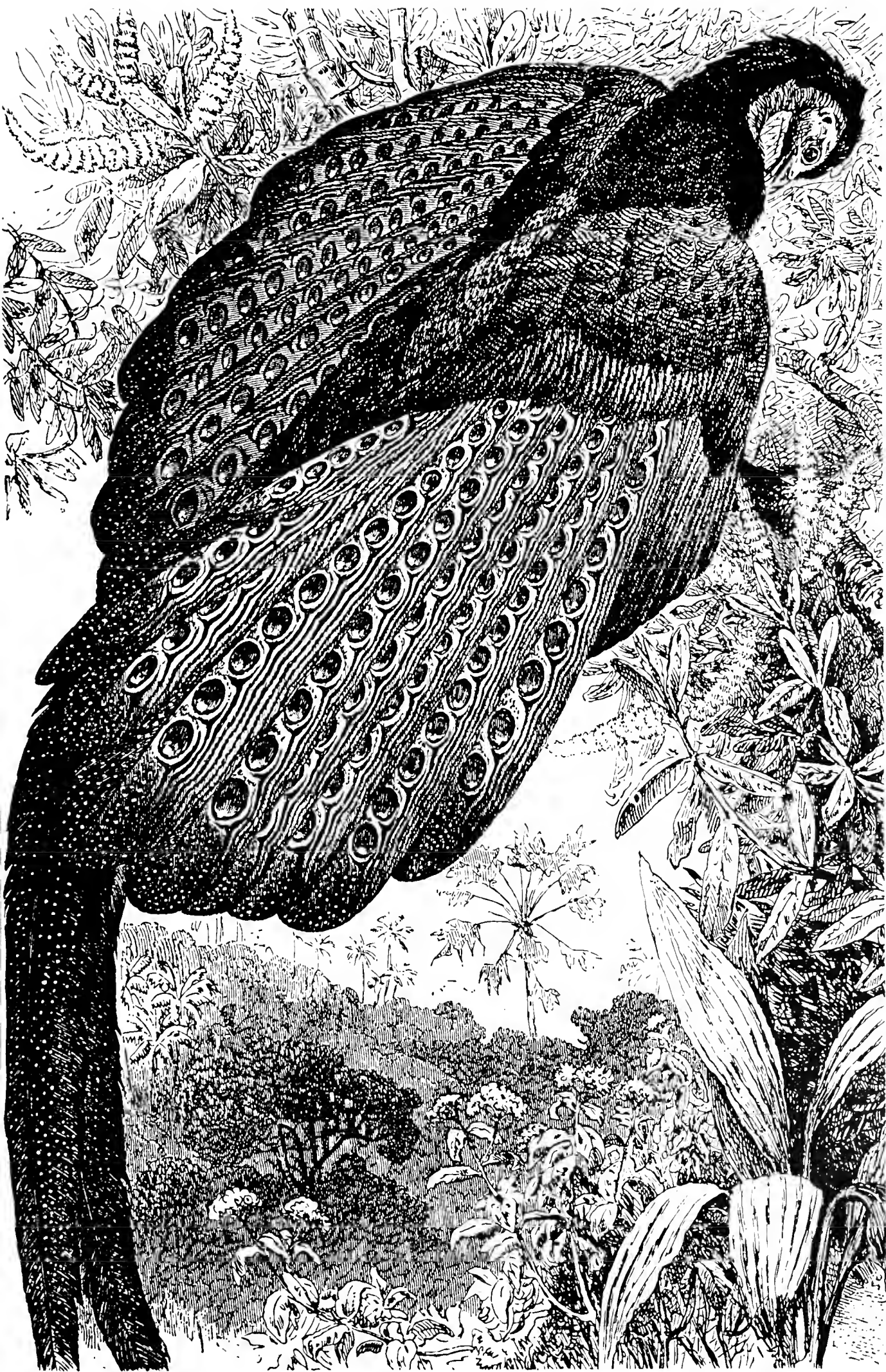


Fig 2: The Great Argus Pheasant *Argusianus argus*. Does Java house an unobserved relative?

features that it had poor aerodynamic properties, and that this species was in all probability flightless. As for its provenance, Davison dismissed Java in favour of the offshore, eastern Malaysian island of Tioman, for as *A. argus* is absent from here, there would be no interspecific competition. Furthermore, Tioman was not zoologically explored until 1899 – almost 30 years *after* the single *A. bipunctatus* feather was first recorded. Hence, if the species became extinct sometime prior to 1899, that would explain why it has never been observed by ornithologists.

Also requiring attention is a smaller but no less mysterious fowl-like bird of South-East Asia – the *alovot* of Simalur (Sumatra). According to a *Temminckia* report by Dr. Edward Jacobson, published in 1937, the *alovot* is of chicken shape and size, sometimes said to bear a small comb on its head (perhaps present only in the male?), with short legs, and a dark-brown plumage decorated with lighter spots. A denizen of the island's densest forests, apparently it is extremely shy, so that only a few natives have ever sighted it, although many are familiar with its constantly repeated clucking call. It supposedly feeds on rice from the ricefields at night, but if surprised it will take to the air at once, albeit via a low, heavy flight (suggesting a move towards flightlessness?). Another noteworthy feature concerning the *alovot* is that its nest is built on or close to the ground – unlike that of any other Sumatran bird, according to Dr. Jacobson. What could the *alovot* be?

If only chicken-sized, then it is much smaller than *A. argus*, which also inhabits Sumatra. Curiously Jacobson considered that it most closely resembled the Crestless Fireback Pheasant *Acomus* [now *Lophura*] *erythrophthalma*. Yet its brown, ocellated plumage, general size, and possession of a comb (crest?) are all features much more reminiscent of some peacock-pheasants (*Polyplectron* spp.). Whatever its specific identity, the recent discovery of Vietnam's *Lophura hatinhensis* readily emphasises that unknown species of pheasant could still be awaiting detection in southern Asia.

Another mystifying and sizeable gallinaceous bird is the *du*, featured in native New Caledonian mythology. At first, it was assumed that the *du* was indeed nothing more than a legend, with no relationship to any real bird form. However, in February 1985, François Poplin and Cécile Mourer-Chauviré reported in *Geobios* that native descriptions of the *du* tally very closely with reconstructions (based upon fossil evidence) of *Sylviornis neocaledoniae*. This was a turkey-sized terrestrial species possibly related to modern-day megapodes or mound-builders. Its fossil remains were first disco-

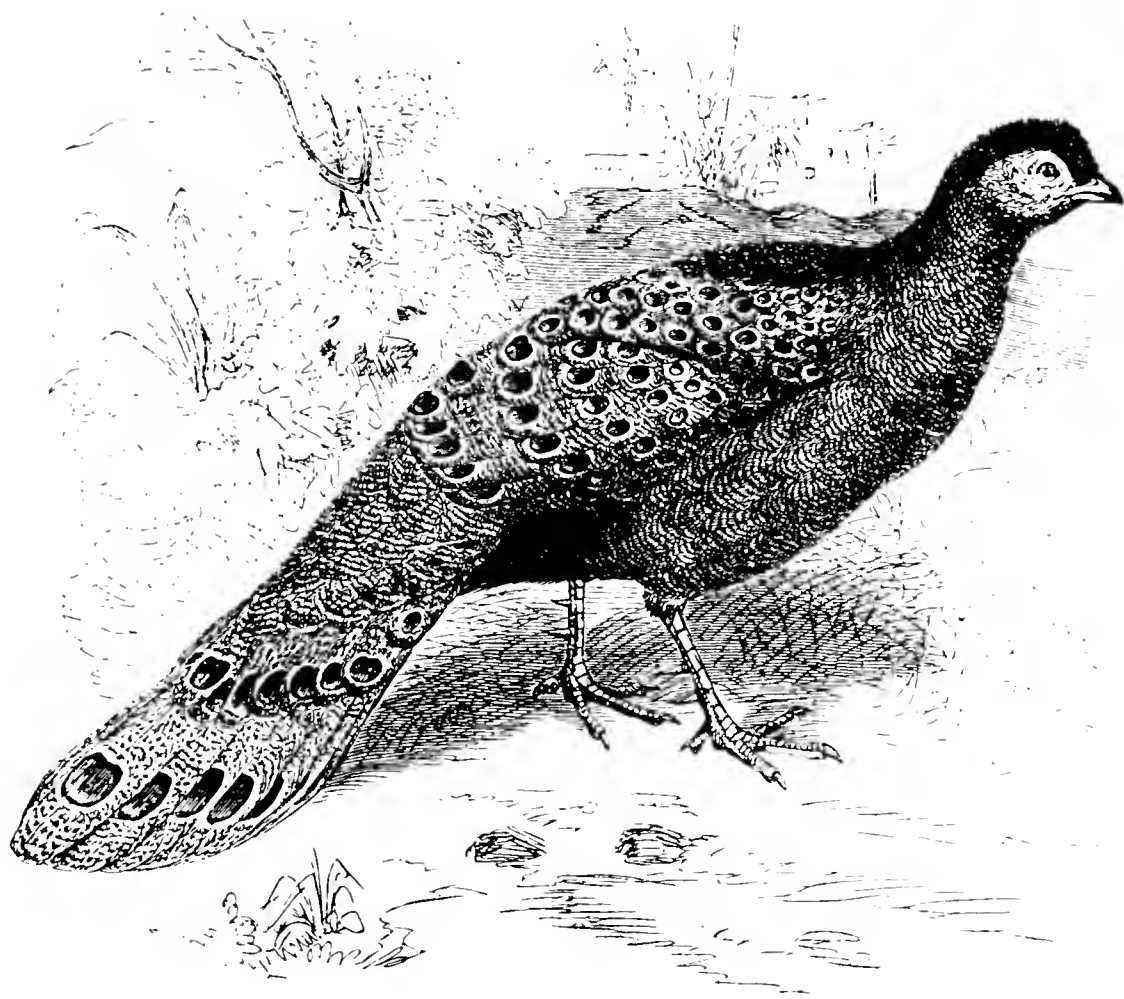


Fig 3: A Peacock-Pheasant (genus *Polyplectron*) Is the *Alovot* an undescribed, related species?

vered in 1974, and date at 3470 ± 210 years BP (Before Present Day). Indeed, the two researchers now believe that it was not exterminated by the region's first human settlers, but became preserved within native memory as the *du*. They also suggest that it may have been responsible for the island's strange, mound-like tumuli.

In *Fatu Hiva*, noted explorer Thor Heyerdahl mentioned the *koao*, a peculiar, wingless bird from Hiva Oa, one of the Marquesas Islands in the Pacific, which cannot be identified with any known species of bird alive today. In his checklist of apparently unknown animals published in 1986 by *Cryptozoology*, Dr. Bernard Heuvelmans noted that the *koao* resembles a rail in appearance, but stated that it is bigger than the island's only known rail species, *Porzana tabuensis* (which in any case seems to have died out here in recent times). In addition, having studied the *koao* case closely and written a scientific paper on the subject in the early 1980s, avian researcher Michel Raynal has postulated that it may be closely related to the Takahe *Notornis mantelli*. This is, of course, the famous flightless rail of New Zealand whose rediscovery in December 1948 after 50 years of "extinction" created a scientific sensation worldwide. Who knows, perhaps some future ornithological investigation on Hiva Oa may

engender a repetition of history!

Worth recalling is that as recently as the early 1980s, a totally new species of flightless rail was discovered. Hailing from the Japanese Ryukyu island of Okinawa, and accordingly named *Rallus okinawae*, this species has a very attractive plumage with prominent markings, making all the more mysterious the manner in which it has succeeded in evading scientific detection for so long.

Another flightless, insular bird that could certainly create a sensation is the so-called Giant Kiwi or *roa-roa*, reported by Ferdinand von Hochstetter during the latter part of the 19th Century from New Zealand's South Island. Three species of kiwi are currently known to science, all of which are far smaller than the turkey-sized *roa-roa*, which additionally possesses sharp spurs – a feature not exhibited by any known kiwi. As a result of such discrepancies, Heuvelmans is very sceptical that the *roa-roa* is a kiwi at all, proposing instead a more controversial but very exciting alternative identity. Namely, that it is a surviving species of moa, quite possibly of the genus *Megalapteryx*, whose species were indeed turkey-sized. Although most authorities consider that the more famous, ostrich-like *Dinornis* died out 300-400 years ago, some believe that *Megalapteryx didinus* was alive as recently as the mid-1800s. Consequently, there is a possibility that a small moa species – probably nocturnal and relatively inconspicuous amongst New Zealand's dense forests – may indeed have persisted into the present day, undetected by science, just like the Takahe. Moreover, in terms of structure such moas as these compared closely to extra-large kiwis (*Megalapteryx* translates as "big kiwi"), providing further reason for equating them with the *roa-roa*.

Despite many reports of expeditions intent upon seeking a living moa, most have succeeded only in imitating their flightless quarry – by failing to get off the ground! However, one notably intriguing moa hunt did take place. In the late 1970s, a Japanese research team set out in search of just such a bird, in a bold attempt to disprove the sceptics, and using a very ingenious "bait". By meticulous study of the neck and throat structure of *Megalapteryx* (using well-preserved fossil specimens) in conjunction with the latest computer techniques for reconstructing or creating three-dimensional structures, the team was actually able to determine, and thence reproduce, the sound that such a bird would have made! And so, armed with their remarkable "lure", plus the equally extraordinary news that, according to locals, such a cry had indeed been heard in recent times in the Fjordland region of New Zealand's South Island, the intrepid team set out.

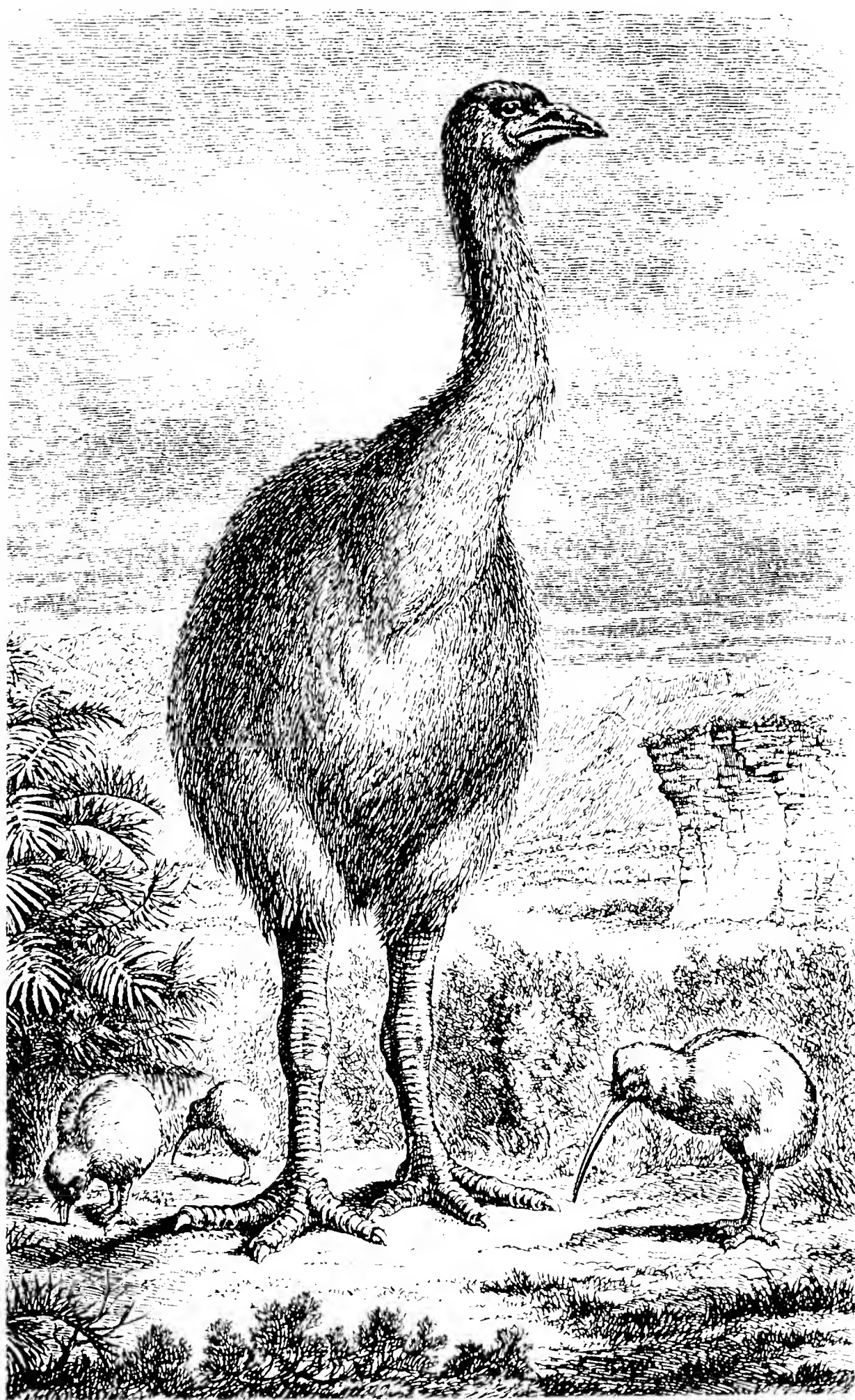


Fig 4: Giant moa and kiwis – could diminutive, superficially kiwi-like moas still exist?
(From: Pouchet, F.A. [1873] *The Universe*.)

While exploring Fjordland's forests and marsh regions, the reconstituted moa call was played at regular intervals, in the hope of enticing a living specimen into view. The expedition's forays were filmed, and later featured in a variety of television programmes, not only in Japan but also far afield abroad. Yet sadly, as one programme's narrator remarked, the Japanese team's moa cry failed to elicit any reply.

A mystery bird that may prove to be a very different form from those hitherto discussed here is the notorious devil-bird of Sri Lanka. It derives its sinister name from its truly hideous cry – more compatible with a banshee than a bird, and a source of considerable fear amongst the island's native peoples – which has been likened to the horrific shrieks that would be voiced by a boy being slowly strangled!

A number of identities have been put forward for this macabre creature, including the Sri Lankan Wood Owl *Strix leptogrammica ochrogenys*, the Sri Lankan Eagle Owl *Bubo nipalensis blighi*, and any one of the island's several species of nightjar. Yet none of these is ultimately satisfactory. The Wood Owl is so familiar a bird here that it seems inconceivable that this species could be responsible for such eldritch cries without the fact having been scientifically verified. Moreover, as with the Eagle Owl, its shape does not match that ascribed to the devil-bird. In one of his noted 19th century works on Sri Lanka, Sir Emerson Tennent referred to a Mr. Mitford – a Sri Lankan inhabitant well-acquainted with the island's varied avifauna, and an enthusiastic seeker of the devil-bird. As well as having heard the latter's blood-curdling cries, Mitford was fortunate enough to spy two birds that he believed to have been of this mysterious species (sightings of devil-birds are generally very rare). He described them as being of pigeon stature, with long tails. Whereas this description agrees fairly well with certain nightjars, the latter birds' apparent inability to produce the devil-bird's hideous cries serves to eliminate these from serious consideration too.

So how can the devil-bird be explained? It is not impossible that a totally unknown species of owl (or even nightjar) exists in Sri Lanka's little-known low-country jungles, protected from human interference by the superstitious horror that its spine-chilling cry engenders. According to the late Indian authority Dr. Salim Ali, a still-unidentified owl form may exist upon the Solomon and Nicobar Islands; moreover, at least four new owl species (including one requiring the creation of an entirely new genus – *Xenoglaux*) have been discovered within the past 30 years. Also worthy of mention is a comparable case from Australia. For many years, the originator of

Equally baffling are the three colossal nests discovered sometime between 1821 and 1823 by James Burton on the Egyptian coast of the Red Sea. According to the pseudonymous(?) "Bonomi", in an *American Journal of Science* report from 1845, the local Arabs alleged that these had been constructed by giant stork-like birds. Although no such bird is known today, "Bonomi" noted that a painted basso-relievo of a gigantic stork – with white plumage, long tail feathers, and a tuft at the back of its head – is sculptured on the wall in the tomb of an officer from Pharoah Shufu's household. Moreover, ancient records from this same period of Egypt's history report that such birds were occasionally caught by peasantry of the delta.

This brief selection of modern-day mystery birds demonstrates that the age of major ornithological discoveries may not have passed by. There could still be a number of sizeable species of bird awaiting formal scientific discovery and description; equally, there might also be other species waiting to emulate Jerdon's Courser and the Madagascan Serpent Eagle, to be dramatically resurrected from extinction. Clearly then, it is to be hoped that future ornithological expeditions to relatively remote areas of the world will take every opportunity to follow up local reports of unfamiliar bird forms, for by doing so the scientific world may well become acquainted with an even greater variety of avifauna than is currently recognised.

(The illustrations in this article are taken from *Cassell's Natural History*, Vol. 4. (1883-9). Ed. P.M. Duncan.)

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NOTES ON THE COMMON PHEASANT

By DEREK GOODWIN
(Pett's Wood, Kent)

The Common Pheasant, or more simply just *the Pheasant*, *Phasianus colchicus*, is found naturally from around the Caspian Sea to Japan (Harrison, 1988) and has been widely introduced to most of Europe, North America, New Zealand, Hawaii and elsewhere. For a very full account of its history as an introduced bird, I recommend Sir Christopher Lever's fine book on introduced birds of the world.

Earlier thought, and claimed, to have been introduced into Britain by the Romans, who certainly kept it as a captive bird at home in Italy and may well have done so in their colonies too, more recent opinions are that the Saxons (Lever) or the Normans (Harrison) were responsible for introducing and establishing it in Britain.

That there has been, and to some extent still is, argument and disagreement as to who introduced this splendid bird here seems to be due to the lack of any positive evidence in the matter.

I have long thought it at least possible that the Pheasant may have been native to this country albeit rare or at least local but will say no more about this generally derided theory here.

The Pheasant originally here was certainly similar to or identical with the form found in and around the Caucasus, whence it is known the bird was brought to Greece and Rome in ancient time. This race, *Phasianus c.colchicus*, is indeed often referred to as "the Old English Blackneck" in contradistinction to the Chinese Ringneck, *P.c. torquatus*, which was introduced in the late 18th century onwards, the various other races such as the so-called Mongolian Pheasant, *P.c.mongolicus*, from Russian Turkestan, the Green Pheasant, *P.c. versicolor*, from Japan and various other races that were later introduced and the hybrid offspring that resulted for, so far as is known, all forms of *Phasianus* interbreed freely when they meet as a result of human manipulation.

Personal involvement:

When I was 16 I was given five Pheasant's eggs by a friendly farmer who had found them, in August, a very late clutch, when harvesting. I put them under a broody hen who duly hatched them but managed to tread on one of the chicks and kill it. Two of the others soon came to grief, I forget now how, but the other two, a cock

and a hen, prospered. They were delightfully tame, and when wandering in the field next to our garden would come running through the grass to my call and take food from my hand. Unfortunately when they were about six weeks old they vanished, presumably having fallen prey to a cat, fox or some other predator.

The following May I obtained seven Pheasants' eggs by my own efforts but perhaps we had better not say how ... These, entrusted to a Bantam hen, were all successfully hatched and reared. Like the previous two they grew up perfectly tame (I mention this because some aviculturists have found this species wild and shy in captivity) and turned out to be two cocks and five hens. One of the advantages of this bird is that the cocks obtain full plumage in their first autumn. How I glugged my eyes and gloated as bright feather after bright feather appeared on the two cock birds until they were in their full glorious adult plumage.

One of them was mediocre, as Pheasants go, with a lot of yellowish colour and a skimpy, narrow and much interrupted white neck-ring. His brother, however, was as beautiful as any pheasant I have ever seen, with a general rich red-bronze body plumage but with a nearly complete and wide, white neck-ring. He looked superficially very like a "Mongolian" Pheasant but had a golden red, rather than an olive bronze lustre.

These birds were at first free in the garden with their foster parent but later, and unwisely as it turned out, their wings were clipped and they were kept in a large, open-topped pen which enclosed a privet hedge, several birch trees and a lot of grass and short shrubbery.

At night the birds fluttered and climbed up onto the privet hedge to roost but, alas, a Fox that broke in one night managed to reach them and kill them all besides many ducks in another pen.

Since then my main involvement with living Common Pheasants has been watching them in a free state. Common as the bird is, it never fails to thrill me and I still cannot decide which is more beautiful, the brilliant burnished plumage of the cock or the subtle camouflage pattern of the hen, who usually has an exquisite mauvish pink tinge to the feathers of her nape and hind neck which is only noticeable when she is seen at close quarters.

One of my last jobs before I retired from the Sub-department of Ornithology of the British Museum (Natural History) was to sort out and revise the pheasant collection there. This involved closely examining large numbers of specimens, in which almost all races of this species were (and are) represented. A labour of love, and enlightenment, which gave me a full idea of the wonderful number

and beauty of "variations on a theme" represented by the various races of this species. A variety of plumage expressed chiefly in the coloration and length of ear tufts of the cocks, for the hens of the different races are much more like each other, differing mainly in the extent and intensity of their dark (usually blackish) markings.

It also made clear to me that to give the Green Pheasant of Japan specific status was illogical, at least unless several other species were to be recognised, for, as I have described elsewhere (Goodwin, 1982), the Green Pheasant differs less in plumage characters from pheasants from China and Burma than they do from those of Central and Western Asia.

Description, Races:

The Chinese saying: "One picture is worth a thousand words" is true if one is trying to give an adequate description of the Common Pheasant. Though only the very best of pictures can give an adequate impression of the full beauty of the complicated patterns, rich colour tones and varying (both intense and subtle) glosses and highlights of this bird's plumage.

However, I think I can safely assume that all of my readers will have seen either living Common Pheasants or good pictures of them and so will be able mentally to "fill in the gaps" if I here give only a very brief and generalised description of the cocks of a few of the better known races or subspecies. All of them are forms that have (although they are not the only ones that have) been introduced into Britain and, I think, the USA. They are also races that well illustrate the extremes of difference within this widespread species.

The "Old English Blackneck" or Southern Caucasian Pheasant *Phasianus c.colchicus* has the top of the head dark greenish, the rest of the head (except for areas of velvety, deep scarlet skin around the eyes) and neck glossy green and purple. The front of the lower neck and breast are deep reddish brown with a rich coppery and purple gloss, the hind neck, back and scapulars rather more golden but similar in hue and much darker than in the ring-necked races from the far East. The lower back and rump are mainly reddish brown and purple and the long, purplish-fringed central tail feathers are olive brown, banded with blackish. Most of the body feathers are tipped or edged with black. The wing coverts are mainly buffish brown.

There are two areas of feathers at either side of the head which are usually inconspicuous but when the bird is in sexual or self assertive mood are erected to form conspicuous ear-like tufts. At the same time the area of red facial skin is expanded and altered in shape (see

sketches).

The so-called Mongolian Pheasant *P.colchicus mongolicus* of Russian Turkestan and Dzungaria, has whitish wing coverts, a broad white collar, interrupted in front, very short “ear” tufts, and a generally deep coppery chestnut body plumage with a peculiar but attractive olive-green sheen or tinge. The black bars on its reddish brown central tail feathers are much narrower and shorter than those of *P.c. colchicus*.

Another of the “white-winged” group of races is the Prince of Wales’s Pheasant *P.colchicus principalis*. It has no white neck ring, is predominantly reddish brown in plumage with dull reddish purple, not black, tips to the feathers of the lower neck and breast. It is found in Afghanistan and southern Turkestan.

The Ring-necked Pheasant *Phasianus colchicus torquatus* from much of eastern China, has a pale greenish brown crown, white supra-orbital stripes, a white neck ring, interrupted in front, the feathers on its upper back and mantle are predominantly golden yellow, contrasting with the mainly chestnut scapulars. The feathers at the sides of its lower breast and on its flanks are light golden, tipped with black and *contrast sharply* with the rich coppery chestnut red of the centre of the breast and lower neck. The wing coverts are mainly light bluish grey and the lower back and rump mainly a silvery bluish green.

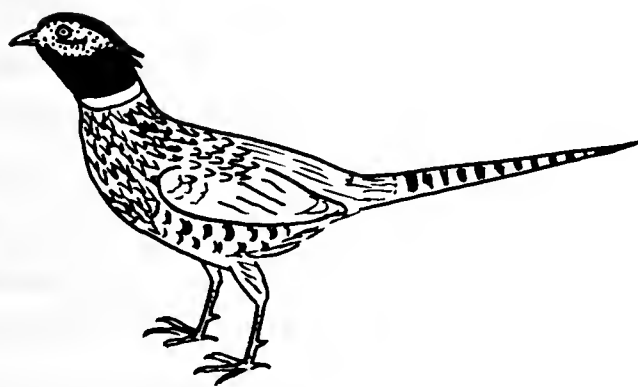
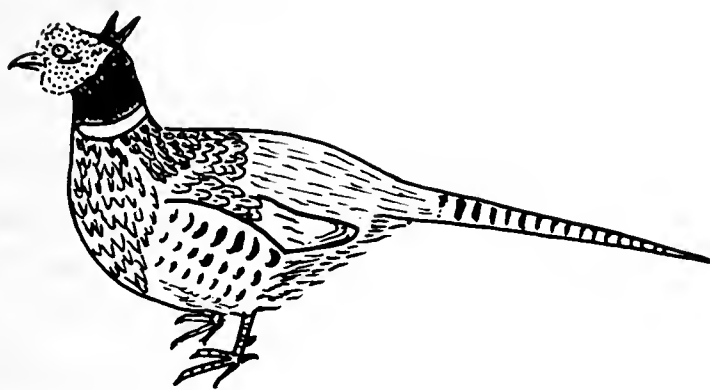
It is an even brighter looking bird and with more contrasting areas of colour than the Blackneck. To the north of its range live the Manchurian Pheasant *P. colchicus pallasii* and the Korean Ringneck *P.colchicus karpowi*, both of which are rather paler and brighter and have broader and uninterrupted white collars.

The Green or Japanese Pheasants include three very slightly different races, *P.colchicus versicolor*, *P.c.tanensis* and *P.c.robustus*. They differ from *P.c.torquatus*, which they otherwise resemble in several details of marking, in having no white on the neck, and the mantle and back (but not the chestnut scapulars), breast and flanks dark green or dark bluish green.

There are very many more races, all of beauty and interest but it would take up too much space to describe them here. There are good descriptions in Raethal (1988) and also briefer ones elsewhere.

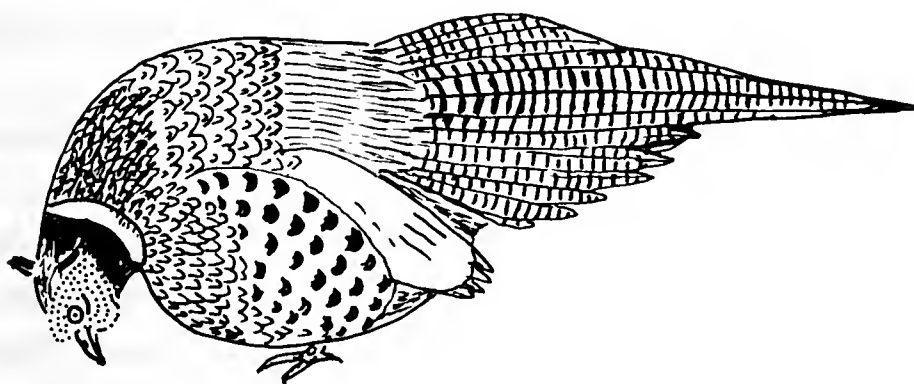
Mutations and racial hybrids:

Three well known mutations have cropped up among the introduced pheasants in England and Europe and have since been bred widely on game farms and in aviaries.



(Top) Cock Pheasant in self-assertive mood with extended facial skin.

(Below) Same bird alarmed, with facial skin retracted.



Cock Pheasant in lateral sexual display.

Most notable, perhaps most notorious one might say, is the dark form or Melanistic Mutant, *var. tenebrosus*. In its full state this form has the cock predominantly dark blackish green and dark purple, and the hen sooty brown or dark chestnut brown with a grouse- (*Lagopus*) like rather than pheasant-like plumage pattern. Varying degrees of melanism may be shown but usually melanistic birds are at once obvious as such. Their chicks, instead of being the complicated cryptic pattern of browns and buffs of normal Pheasant chicks are dark with white areas on the head and so are, presumably, more easily visible to predators. This is perhaps why although these melanistic birds are said to be hardier than normal birds, no melanistic form has evolved in a purely wild state.

The myth that this melanistic form is the result of hybridisation with the Green Pheasant has been repeated by many ornithologists who should have known better, or been willing to take the word of Delacour, who did, and who has clearly shown its falsity. The Melanistic Mutant is a colour variety comparable with the dark chestnut varieties of the Common and Red-legged Partridges *Perdix perdix* and *Alectoris rufa*, the dark mutant of the domesticated Japanese Quail *Coturnix japonica*, or the Black East Indian Duck. Anyone who takes the trouble to compare skins will see that the cock bears only a very superficial resemblance to the Green Pheasant and the hen none at all.

An apparent dilute variety, comparable to "silver" in domestic Pigeons and "cinnamon" in Canaries, is usually called the Bohemian Pheasant. In this variety the cock has all the normally golden, reddish or chestnut feathers of a pale, slightly pinkish fawn, tipped with dull greyish rather than glossy black or purple, and the normally glossy dark green and purple parts of the head or neck are of a peculiar dulled appearance. Except for its novelty, the Bohemian Pheasant has little to recommend it, by comparison with normally coloured birds.

The same is true, in my estimation, for the white variety, even when, which is far from usually the case, the plumage is entirely white with no odd coloured feathers here or there. Some writers have enthused over the beauty of the snow white Pheasant with its contrasting red facial skin. Certainly if their plumage is clean, such birds are striking in appearance though not more than one of the more shapely breeds of white Domestic Fowl (which could, of course, be reared and kept more easily and cheaply). However I am perhaps in a minority in this value judgement. Certainly those responsible for filling public aviaries seem far more inclined to put white or piebald

Pheasants on show than the beautiful, normally coloured birds. Even in one case a magnificent tame pair of Chinese Ringneck type Pheasants was got rid of in favour of a wild and scruffy trio of piebald birds.

The various races appear to interbreed freely wherever they are brought into contact by man. One result of this, which became apparent when I examined skins at the museum, is the production of many cock birds which superficially bear a resemblance to the Chinese Ringneck (and allied races) but are more uniformly pale and golden in hue without strong contrast (as in the wild *P.c.torquatus* and its allies) between the golden feathers on the flanks and the darker, reddish feathers on the breast.

Though the generally pale golden coloration of such birds makes them at first sight very unlike the Old English Blackneck or the Mongolian, I wonder if genes from one or both of the latter that are, perhaps, responsible for a more or less even coloration over upper and underparts, are dominant over genes for contrasting flanks, etc., of the Ringneck but the latter's genes for pale golden or mantle and flanks are responsible for the colour itself?

Be this as it may, such relatively uniform golden birds (with white neck-ring and the usual green neck above it) are not, as is often thought, identical with any *wild* ring-necked race of the species.

Future Prospects

The Common Pheasant is often instanced as a species that is in no danger *because* of the interest shown in it by Sportsmen (e.g. Johnsgard). There can be no doubt that, as Robertson claims, its numbers in Britain are greatly increased by the release of large numbers of artificially reared young birds each year. In much of Europe it is thought that the Pheasants would die out but for such measures (Raethel, Schulte).

That in the past the Pheasant maintained itself in the wild state in Britain is certain but it is less certain that it will always manage to do so.

There is evidence that "reared" Pheasants, which are often kept under very unnatural conditions, are less viable when free than wild-bred birds (Robertson). So it is possible that the continual addition of captive-reared birds to the stock may work against the evolution of a type well suited to survive in the wild.

Sportsmen have ideas, which may or may not be valid, as to fitness of different forms of Pheasants for their purposes. Schulte states that the "Mongolian" race is the hardiest and least inclined to roam far,

the Ring-necked the best adapted to farmland, and the Black-necked the least conspicuous to predators and the best adapted to a European environment. I suspect the last idea may be prevalent in Britain too as I have noticed, at least in parts of Kent, Surrey and western Scotland, that most of the Pheasants one sees, and all of the recently released birds, are of Blackneck type (more or less). A very different situation to that before and immediately after the war when most of the cock Pheasants I saw had complete or partial white neck rings.

Unfortunately, because of its relationship to sport, the attitude of many bird watchers to this beautiful and interesting species ranges from complete lack of interest to passive, and occasionally even active, hostility. It is unlikely that many of them would raise a finger to save it if it were threatened. While, if by any chance some supposedly better gamebird could be found to take its place, it is unlikely that the sportsmen would be more concerned about its fate than they are over that of Red-legged Partridge which they have been happy to try to eliminate as a pure species because they believe that Chukars and hybrids will serve their purpose better.

Tameness and wildness

The Common Pheasant has a generally bad reputation for wildness in captivity. That in panic it will fly up with considerable force and injure or even kill itself if the aviary top is of wire or solid material is no doubt true. So will many other gamebirds. This can, however, be prevented by clipping or partially clipping both wings so the bird cannot rise with force. Clipping *one* wing will make it liable to crash land awkwardly and hurt itself that way. However, so far as general timidity is concerned, I do not think this is likely to be a problem if a brood are reared under a Bantam and given plenty of attention and hand-feeding with insects or other titbits. In the 1960s there were many Pheasants in Kew Gardens that had become half tame and before the war there were at least three in St James Park that were absolutely tame and used to take food from people's hands without the slightest sign of nervousness.

The most remarkable instance I saw of a wild Pheasant becoming tame was of a fine cock that would come and take food from the little son of some friends of mine. This bird only trusted the little boy; if he saw either of his parents or any other adults he would flee at once and yet he would come boldly up to the child to be fed by him.

Does the Common Pheasant feed her young?

In many gamebirds, including the Golden Pheasant, domestic fowl, Common Partridge *Perdix perdix*, and Red-legged Partridge *Alectoris rufa*, the mother, or both parents, call the young and give them insects or other suitable food that they have found (although the young also find a lot of food for themselves). I can find no positive evidence for the hen Common Pheasant doing so and Robertson implies the contrary. However, in view of the fact that the cock bird feeds the hen (there is a lovely photograph of this in Raethel's book) my guess is that observation would show that the hen Common Pheasant is no exception to the general rule and that she does feed her young. Can some of our members give definite information on this?

Pheasant and Fox

I will end with a little anecdote. On the 21st June 1988. I was on a valley side and heard on the other side the *cho'tok! cho'tok* alarm call of a cock Pheasant. I saw at the wood edge on the opposite slope a cock Pheasant on a strip of nearly bare ground. Suddenly a Fox came out of the wood edge. The Pheasant walked quickly away (*but did not run*) until he was about 25 yards from the Fox. The Fox walked towards the Pheasant but seemed not interested in it (knew he could not catch it?) and soon vanished back into the wood edge. The Pheasant then returned to where he had first been and suddenly I noticed a hen there, who gave the sudden little hop which (I think) indicates sexual interest as he displayed briefly to her. What struck me was the relative lack of fear the Pheasant showed, compared with how he would almost certainly have behaved had a man appeared anywhere near him. He evidently thought, rightly, that as long as he kept his eye on the Fox he was quite safe.

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NOTE: The line drawings are just to give some idea. They have no pretensions to art or detailed accuracy.

* * *

A VISIT TO SOME INDONESIAN ZOOS AND BIRD MARKETS

By KEVIN J. BELL

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and ROBERT SEIBELS

(Curator of Birds, Riverbank Zoo (Columbia, S.C.)

For bird enthusiasts few experiences can match the thrill of travelling to a foreign country to see exotic birds in their native habitat. For zoo curators it is likewise exciting to visit foreign zoological gardens, examine methods of exhibition, husbandry and in many cases view species that we have never had the opportunity to work with. In April 1989, while participating in meetings on the Bali Mynah reintroduction project, the authors had the chance to visit several zoos and bird markets in Indonesia. The notes below will highlight our visit.

Kebun Binatang Ragunan (Jakarta Zoo)

Originally a small city zoo, Ragunan moved outside Jakarta in 1964 and now comprises 200 well maintained hectares. Some two million people visit this facility each year to view almost 3,800 animals representing 400 species. The zoo director, Linus Simanjuntak, DVM, who is also the editor of the Indonesian wildlife magazine, *Voice of Nature*, heads a staff of four curators, several veterinarians and 200 keepers. A one-billion Rupiah (575,000 U.S. dollars) budget is partially achieved through gate receipts as well as the sale of "zoo-doo" which is packaged and sold throughout Jakarta as a plant fertilizer. A 2kg bag sells for about 1000Rp (about 60 U.S. cents). The 1987-1988 inventory (ending 31st March, 1988) lists the bird collection as follows: 16 orders, 38 families, 201 species and 1,988 specimens. Glancing at these numbers we were amazed that each

species averaged 100 specimens! However, translation of the Indonesian column headings indicate that these numbers reflect many free flying residents of the park such as 250 Little Black Cormorant *Phalacrocorax sulcirostris*, 263 Black-crowned Night Heron *Nycticorax nycticorax*, 175 Spotted Dove *Streptopelia chinensis*, 50 Yellow-vented Bulbul *Pycnonotus goiavier*, 50 Pied Starling *Sturnus contra*, etc. Although the collection did not include a large number of endangered species, it did provide us with an excellent look at many Indonesian and regional species. Of particular interest are 20 species of pigeons and doves, 41 species of parrots and seven hornbill species.

Further information on the collection can be obtained from Dr. Simanjuntak or the Curator of Birds, Abdullah Baab.

Kebun Binatang Surabaya (Surabaya Zoo)

Located near the centre of Surabaya, this 16-hectare zoo is under the direction of Stany Soebakir. The animal collection consists of approximately 3000 specimens representing 325 species. Most popular with the two million annual visitors are the breeding display of Komodo Dragons, the onsite aquarium and museum and the Bali Mynah propagation facility. Also worthy of note are the Javan Grey Gibbons *Hylobates moloch*, Babarusa *Babyrousa babyrousa*, Bawean deer *Axis kuhli*, Javan Warty Pig *Sus verrucosus*, several species of Anoa and a large collection of Bornean Orang-utan *Pongo p. pygmaeus*.

The bird collection (approximately 150 species and 1000 specimens) is dominated by aquatic taxa including a breeding group of Australian Pelicans *Pelecanus conspicillatus*. Other species of interest include the Slaty Woodpecker *Mulleripicus pulverulentus*, Laced Woodpecker *Picus vittatus*, and several Friar-birds *Philemon* sp.

As mentioned above, a highlight of the Surabaya Zoo is the Bali Mynah propagation centre. This facility houses the 38 captive-hatched birds sent to Surabaya from United States zoos in 1987 as well as two pairs from the Jersey Wildlife Preservation Trust and 14 Indonesian birds. The offspring of these birds are sent to a pre-release training centre in Bali Barat National Park prior to their release into the wild. The first three birds were released in August 1988. For more information on this project see "Animal Kingdom" magazine Vol.92:2 pp.38-43. or contact Bob Seibels at the Riverbanks Zoo, Columbia, S.C. USA.

Jakarta and Surabaya Bird Markets

Having read articles on Asian bird markets (i.e. Boswall, *Avic.*

Mag. 92:3) we knew that this was an experience not to be missed; we were not disappointed. Although the humidity and odour at midday can be overpowering, the variety of species and the number of individuals of certain species was truly overwhelming. As we walked down dark aisles peering into overcrowded cages, we were besieged continuously by salesmen. Even photographing individual birds required payment in certain areas. With the assistance of Bas van Balen, a field ornithologist in Indonesia, we compiled a species list from the markets in both cities. This list along with comments where appropriate follows:

COMMON NAME	SPECIFIC NAME	COMMENTS
Little Cormorant	<i>Phalacrocorax niger</i>	nestlings
Purple Heron	<i>Ardea purpurea</i>	Jakarta only
Crested Serpent Eagle	<i>Spilornis cheela</i>	Jakarta only
Green Junglefowl	<i>Gallus varius</i>	
Common Moorhen	<i>Gallinula chloropus</i>	
Pink-necked Pigeon	<i>Treron vernans</i>	Surabaya only
Orange-breasted Green Pigeon	<i>Treron bicincta</i>	
Pink-necked Fruit Dove	<i>Ptilinopus porphyrea</i>	
Peaceful Dove	<i>Geopelia striata</i>	thousands
Javanese Collared Dove	<i>Streptopelia bitorquata</i>	
Spotted Dove	<i>Streptopelia chinensis</i>	
Green-winged Pigeon	<i>Chalcophaps indica</i>	
Eclectus Parrot	<i>Eclectus roratus</i>	
Moustached Parrakeet	<i>Psittacula alexandri</i>	
Rainbow Lory	<i>Trichoglossus haematodus</i>	
Lesser Sulphur-crested Cockatoo	<i>Cacatua sulphurea</i>	Jakarta only
Red Lory	<i>Eos borneo</i>	
Yellow-backed Lory	<i>Lorius garrulus flavopalliatu</i>	
Lesser Coucal	<i>Centropus bengalensis</i>	
Buffy Fish Owl	<i>Ketupa ketupu</i>	4 birds
Wreathed Hornbill	<i>Aceros undulatus</i>	6 birds
Red-throated Barbet	<i>Megalaima mystacophanos</i>	
Lineated Barbet	<i>Megalaima lineata</i>	
Fire-tufted Barbet	<i>Psilopogon pyrolophus</i>	
Golden-backed Three-toed Woodpecker	<i>Dinopium javanense</i>	Surabaya 1
Fulvous-breasted Woodpecker	<i>Picoides macei</i>	Surabaya 1
Long-tailed Broadbill	<i>Psarisomus dalhousiae</i>	Jakarta 5
Blue-winged Pitta	<i>Pitta moluccensis</i>	
Banded Pitta	<i>Pitta guajana</i>	
Singing Bush Lark	<i>Mirafra javanica</i>	
Blue-winged Leafbird	<i>Chloropsis cochinchinensis</i>	

Greater Green Leafbird	<i>Chloropsis sonnerati</i>	
Yellow-vented Bulbul	<i>Pychonotus goiavier</i>	
Straw-headed Bulbul	<i>Pychonotus zeylanicus</i>	
Orange-spotted Bulbul	<i>Pychonotus bimaculatus</i>	
Sooty-headed Bulbul	<i>Pychonotus aurigaster</i>	
Grey-cheeked Bulbul	<i>Criniger bres</i>	
Greater Racquet-tailed Drongo	<i>Dicrurus paradiseus</i>	
Hair-crested Drongo	<i>Dicrurus hottentottus</i>	
Black-naped Oriole	<i>Oriolus chinensis</i>	
Fairy Bluebird	<i>Irena puella</i>	
Short-tailed Green Magpie	<i>Cissa thalassina</i>	
Slender-billed Crow	<i>Corvus enca</i>	
Great Tit	<i>Parus major</i>	
Horsfield's Jungle Babbler	<i>Trichastoma sepiarium</i>	
Chestnut-capped Babbler	<i>Timalia pileata</i>	
White-crested Laughing Thrush	<i>Garrulax leucolophus</i>	
Black-throated Laughing Thrush	<i>Garrulax chinensis</i>	
Hwamei	<i>Garrulax canorus</i>	200+
Red-billed Leiothrix, Pekin Robin	<i>Leiothrix lutea</i>	
White-rumped Shama	<i>Copsychus malabaricus</i>	males only
Magpie Robin	<i>Copsychus saularis</i>	
Grey or Pied Bushchat	<i>Saxicola ferrea</i> or <i>caprata</i>	
Blue Whistling Thrush	<i>Myiophoneus caeruleus</i>	
Chestnut-capped Thrush	<i>Zoothera interpres</i>	
Lesser Brown Prinia	<i>Prinia rufescens</i>	
Bar-winged Prinia	<i>Prinia familiaris</i>	
Ashy Tailor Bird	<i>Orthotomus ruficeps sepium</i>	
Blue and White Flycatcher	<i>Cyanoptila cyanomelaena</i>	
Hill Blue Niltava	<i>Niltava banyumas</i>	
Pied Fantail	<i>Rhipidura javanica</i>	
Long-tailed Shrike	<i>Lanius schach</i>	often dyed
Black-winged Starling	<i>Sturnus melanopterus</i>	
Asian Pied Starling	<i>Sturnus contra</i>	
Glossy Starling	<i>Aplonis minor</i> or <i>panayensis</i>	
Common Mynah	<i>Acridotheres tristis</i>	
Crested Mynah	<i>Acridotheres cristatellus</i>	
Jungle Mynah	<i>Acridotheres fuscus</i>	
Hill Mynah	<i>Gracula religiosa</i>	Jakarta only
Brown Honeyeater	<i>Lichmera indistincta</i>	
Sunbird	<i>Nectarinia</i> sp.	
Grey-throated white-eye	<i>Lophozosterops javanica</i>	
White-eye	<i>Zosterops</i> sp.	
Pin-tailed Parrot Finch	<i>Erythrura prasina</i>	
Java Sparrow	<i>Padda oryzivora</i>	
Java Munia	<i>Lonchura leucogastroides</i>	
Scaly-breasted Munia	<i>Lonchura punctulata</i>	

White-headed Munia
Eurasian Siskin

Lonchura maja
Carduelis spinus

Those readers planning a trip to Indonesia should also consider visiting the Taman Mini bird park in Jakarta. We were quite impressed with the large variety of Asian species on exhibit in the walk-through aviaries. Unfortunately our visit was shortened by heavy rains which closed the facility. Identification of the birds at the zoos and bird markets is best accomplished by using King's *Field Guide to the Birds of South-east Asia* and John Mackinnon's *Field Guide to the Birds of Java and Bali*. Current field work in Indonesia can be followed in "*Kukila*", the bulletin of the Indonesian Ornithological Society, P.O. Box 287 / JKSMG, Jakarta Selatan 12710A Indonesia.

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ISLAND COCKATOOS — A CONSERVATION APPEAL TO AVICULTURISTS

By WILLIAM "TREY" TODD, III
(Houston, Texas, USA)

To defend their avocation, aviculturists often refer to the salvation of endangered species through captive reproduction. Two examples are frequently cited: the Hawaiian Goose *Branta sandvicensis* and the Bali Mynah *Leucopsar rothschildi*. Though neither species is yet secure in the wild, both breed well in artificial situations, and their responsiveness to avicultural management has ensured survival — at least in confinement. Reintroduction programmes, though beset with political difficulties, have demonstrated effective cooperation among public and private members of the avicultural community.

The status of island cockatoos now provides aviculturists with opportunities to save species whose wild populations are almost certainly beyond the point of natural recovery. Husbandry techniques are well developed, and suitable numbers of specimens are presently in captivity. To date, however, their critical situation in the wild has received only limited publicity.

Though the vulnerability of island endemics to habitat alteration or hunting pressure is well documented, the precipitous decline of island cockatoos also results from over-harvest for aviculture, or, more accurately, for the international pet trade.

Five species are seriously threatened (and are consequently numerous in trade): Red-vented *Cacatua haematuropygia*, Lesser Sulphur-crested (Citron-crested) *C. sulphurea*, Goffin's (Tanimbar) *C. goffini*, Umbrella (White) *C. alba*, and Moluccan (Salmon-crested) *C. moluccensis*.

The Red-vented Cockatoo has become, within the last decade, the Philippines' most threatened bird, second only to the Philippine (Monkey-eating) Eagle *Pithecophaga jefferyi* (Collar, 1989).

Though this species has not appeared in western trade as frequently as the others, it is apparently being trapped and traded extensively within its homeland.

Five subspecies of the Lesser Sulphur-crested Cockatoo occur on the Indonesian islands off Sulawesi (Celebes), its satellite islands, and the Lesser Sundas from Penida and Lombok east to Timor (Forshaw, 1978). IUCN (International Union for the Conservation of Nature) documents (in Collar, 1989) indicate that in 1984 and 1985 Indonesia officially exported 2,986 and 3,990 specimens. CITES (Convention on International Trade in Endangered Species) member nations record imports in those years of 6,415 and 7,884 birds, indicating that much larger numbers are leaving Indonesia than are officially reported. It is probable that additional specimens were exported to non-CITES countries. And one can only speculate on mortality attendant on the capture of such numbers of wild birds (for which no figures are recorded).

The Goffin's Cockatoo is endemic to the Tanimbar islands, Indonesia, and is heavily trapped both for trade and to reduce maize predations. According to Low (1986), the islands were drastically deforested in the 1970s and large-scale export of the species commenced. Official export numbers for the years 1983 and 1984 were 5,233 and 9,140 while CITES countries reported imports of 14,218 and 10,945. Official export figures for 1985 and 1986 (no corresponding import figures are available) — 7,314 and 8,306 — reflect the magnitude of continuing trade.

The Umbrella Cockatoo is found on Halmahera and adjacent islands of the northern Moluccas, Indonesia. As recently as 1986,

flocks of over 30 birds were seen in some areas but had disappeared by the following year (Collar and Andrew, 1988). It is reported to be widely shot for food as well as trapped. Official exports for the years 1983 and 1984 were 6,395 and 8,698; CITES imports, 13,206 and 12,193 (Collar, 1989). In 1985 and 1986, Indonesia legally exported 7,164 and 7,884 (corresponding import figures are not available) (Collar and Andrew, 1988).

The Moluccan Cockatoo was abundant until recently on Ceram and nearby islands of the southern Moluccas, Indonesia, but it had declined so drastically that in 1988 the Species Survival Commission of the IUCN listed it among the twelve most critically endangered species of animals and plants (Jackson, 1988). Officially exported numbers for 1983 and 1984 were 6,415 and 7,655; CITES imports in those years 9,625 and 9,639 (Collar, 1989). Legal exports for 1985 and 1986 were 7,525 and 7,360 (corresponding import figures are not available) (Collar and Andrew, 1988).

Even within Manusela National Park (1800km²) it is reported to have become very scarce despite large areas of undisturbed habitat: a survey conducted between July and September 1987, located what appeared to be a maximum number of 20 individuals (Bowler and Taylor, 1987).

Of large size, showy plumage and, when hand-reared, often affectionate disposition, Moluccan Cockatoos are among the most popular cage birds. Their reputation among aviculturists, however, is of nervousness, and their breeding is considered more difficult to induce than that of their congeners. In recent years, at least in the United States, massive importations have caused the market value of the birds to drop and this, with their unsteady temperament, has discouraged many aviculturists from attempting to breed this species. In zoos the mistaken notion persists that private aviculturists are producing substantial numbers (as they are of many other psittacine species) and that a non-breeding exhibit of Moluccan Cockatoos is thereby justified. According to International Species Inventory System (ISIS) Abstracts of 31st December 1988, 53 zoos listed the species in total numbers of 63, 43, 35 (males, females, unsexed), yet 31 of these institutions listed only birds of one sex or of unknown sex. Only 17% are known to be captive-hatched; only three birds were reported hatched within the previous 12 months. Additional numbers of potential breeders are doubtless held by zoos not listing the species with ISIS.

Most captive birds — no accurate estimates are available — are

held by individual owners and private aviculturists, and it is hoped that, as knowledge of these species' impending extinction in the wild spreads, despite current market prices, more effort will be made to develop management techniques for sustained breeding while numbers adequate to maintain genetic diversity are available.

Criticism will no doubt be levelled at the avicultural community for creating — or at least for abetting (by implicit support of the pet trade) — the demand which threatens these birds. To uphold their avocation's credibility, zoo curators and private aviculturists must cooperate to ensure successful maintenance and reproduction of these species with genetic variability and in optimum numbers to sustain reintroduction efforts should they become feasible. The very existence of these unique, beautiful birds may be their responsibility.

ACKNOWLEDGEMENTS

This paper presents no new information. My intent is only to disseminate knowledge to aviculturists for the reasons stated herein. Its inception arose in conversation with my friend Roland Wirth, chairman of the Zoologische Gesellschaft für Arten- und Populationschutz (Zool. Soc. for the Conservation of Species and Populations), who had previously brought this information to the attention of German aviculturists. Donald Bruning, chairman of the ICBP Parrot Specialist Group commented instructively on the manuscript.

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A note at going to press:

This article was submitted for publication in spring 1989.

Though the cockatoos' situation has doubtless not improved in the time of going to press, some changes have occurred, most notably the inclusion of the Salmon-crested Cockatoo on Appendix I of CITES. It has also been suggested that additional threats, such as introduced "Cockatoo beak- and feather feather-loss syndrome" may impact island populations. It is hoped that new and more thorough surveys will soon provide more accurate appraisals.

REVIEWS

INTRODUCTION TO SOUTHERN AFRICAN CAGE AND AVIARY BIRDS. VOLUME 2: SEED EATING BIRDS.

Compiled by Neville Brickell. Illustrated by Rex M. Shirley. Published by ARU, Republic of South Africa, 1989.

ISBN 0-620-12983-2. Two hundred and ninety-five page paperback, 23 colour photographs, including those on the covers, numerous black and white illustrations, maps, etc.

A review of Volume I, appeared in the *Avicultural Magazine*, Vol. 93, No. 3, pp. 176–177. Volume I included the typical Waxbills, Pytilias, Firefinches, Twinspots, a Crimsonwing, a Seedcracker, Mannikins, Whydahs, Widow-birds, Weavers/Bishops (genus *Euplectes*), Queleas and Buntings.

The present volume brings together an assortment of other seed eating species; namely, Francolins, Quail, Guineafowl, Button Quail, Sandgrouse, Pigeons and Doves, Parrot species, Larks, Finch Larks and various members of the Weaver family, including Sparrows and Petronias, not dealt with in the first volume.

This new volume, as before, takes in birds found in Africa south of the Caprivi Strip. In effect, it means approximately the southern third of Africa; it includes the Republic, Namibia, Botswana, Zimbabwe and Mozambique.

Contents come under the headings, Breeding, Housing, General Management, Nutritional Principles, Feeding, Ailments and Diseases, and Topography of a bird.

The species' accounts cover some 67 species and, where applicable, the races. Included among that number is 12 species of Francolins, three Quail, 11 Pigeons and Doves. The Cape, Brown-headed, Meyer's or Brown and Ruppell's Parrots, with the Rosy-faced, Lilian's and Black-cheeked Lovebirds, make up the Parrot species. As well as the English and scientific names, there is each species' Afrikaans name and alternative English names. There is a description of each species and in some instances races as well. Their range in southern Africa is given and each species' habitat is described, so is their diet in the wild and in captivity in southern Africa. Likely to be most helpful to bird-keepers is the descriptions of the various species' nesting habits. Their more general habits/behaviour are under the heading 'Behavioural/Characteristics'. In some instances, predators are listed, eg. readers are told Meyer's or the Brown Parrot, may be preyed on by the Peregrine Falcon.

Our fellow member Neville Brickell's 23 excellent colour photo-

graphs show 22 species. Both male and female Tambourine Dove are shown, though unfortunately, separately in different parts of the book, not even on consecutive pages, so they could be more easily compared. Many of the other species are the subject of monochrome illustrations. Most work well; some, eg. Ruppell's Parrot (p.152) and the Red-billed Buffalo Weaver (p.179), I find especially attractive. A few are not so successful.

The final part includes a miscellaneous assortment of information. Included is a list of hybrids, notes about photographing and showing birds, followed by the Show Rules and Regulations of the South African National Cage Bird Association. There are details of places in southern Africa likely to interest bird-keepers, also a list of Bird Clubs and Associations in South Africa and Zimbabwe. In addition there is what appears to be a fairly comprehensive account of the laws as they relate to wild birds in that part of the world.

Some information is included in both volumes. This may irk purchasers of the two, but on the positive side, means both volumes are self-sufficient in their own right.

I understand Volume 2 will be available from about five outlets here in Britain. I do not have a price for it. I suggest that enquiries are addressed to:- Neville Brickell, Avicultural Research Unit, 100 Innes Road, Durban 4001, Natal, South Africa.

M.E.

CHOUGHES AND LAND-USE IN EUROPE. Proceedings of an International Workshop on the Conservation of the Chough, *Pyrrhocorax pyrrhocorax*, in the EC. 11-14 November 1988.

Edited by Eric Bignal and David J. Curtis. One hundred and twelve page A4-sized paperback. ISBN 0-9515038-0-4. Available from the Scottish Chough Study Group, Quinhill, Clachan, Tarbert, Argyll PA29 6XN, Scotland. Price £10 post free.

Papers from the conference jointly organised by the Scottish Chough Study Group, the Nature Conservancy Council and the Environmental Management Unit at Paisley College of Technology, with financial support from the World Wide Fund for Nature. It took place at Orierton Field Centre, Pembroke, South Wales, and involved about 50 participants from most of the European countries where choughs live.

M.E.

NEWS AND VIEWS

June and Paul Bailey write from Dorking, Surrey, to report the parent-reared breeding of Fairy Lories *Charmosyna pulchella*.

They believe that this is the first parent-reared breeding since that of E.J. Brook in 1914 although they say that Data Birds have hatched and hand-reared two this year (1989). The young bird was seen in the nest by fellow Avicultural Society members Mr. and Mrs. F. Cooke and Mr. Cyril Laubscher.

* * *

Mr. Peter Craig writes from the Avicultural Research Unit in Durban, South Africa:

"An English translation of the writings of the late A. João appeared in an article, "The Feeding and Breeding of Three *Poicephalus* Parrots in Captivity and in the Wild", by Neville Brickell (*Avicultural Magazine*, Vol. 91, No. 3, pp. 162-165, 1985). Since it was published a few readers have enquired whether the Niam Niam Parrot was introduced to Mozambique or if escapees had been recaptured as the range of this species is the eastern Cameroons, Central African Republic and southern Sudan. The confusion arises in the translation from Portuguese where it reads in the article. "In Mozambique three recently caughtlong."

"In 1987, shortly before his death, I met João at Bangassou airport where he informed me that the birds were trapped by a fellow truck driver whose home was a village at Yel. He delivered the birds to the coast. The birds were purchased by N. Bicknell in Kenya where they eventually ended up in the aviaries of the João family in Mozambique. In 1975 the wire on all the aviaries was slashed to give the impression that the birds had been allowed to escape, but he believed that they were stolen that night. One of the hybrids had been reported to have been sold at the city market some two months later."

* * *

Robin Restall writes from Hong Kong:

"I have just heard from a friend in Australia about the results of the breeding season just closed (1989). Being a very busy business man with a lot of travelling he was unable to devote the attention to his birds they needed (sounds familiar so far, doesn't it) so he decided to run his aviaries together forming just two large flights. He reports that he bred Pin-tailed Whydahs and Red-shouldered Whydahs and

various bishops and grenadiers. The Pin-tailed Whydahs '.....were not so successful as in previous years and we only bred five, but that's better than none'.

"He then goes on to enumerate the smaller finches: Rufous-backed Mannikins, over 15; Cutthroats, over 20; Tri-coloured Munias, over eight, White-headed Munias, over 10; Cordon-bleus, over 20. His success with the common waxbills made me smile with appreciation: '...Orange-breasted Waxbills, Firefinches and St. Helena Waxbills, heaps (over 50 each); Black-headed Siskins, over 20; Red Siskins, 21; Green Singing Finches, 6; Tree Sparrows, 8; Crested Masked Finches, over 40; Jacarini Finches, over 20; Bichenos, over 20; and a few quail.

"Clearly for the breeder, David Holmes, it wasn't a very good season and he explained the steps he was taking to improve matters for next year. Oh yes, those aviaries... they're 96' (29.26m) long; one is 53' (16.15m) wide and the other a mere 20' (6.09m) wide."

Robin continues: "I am working on what I intend to be the most comprehensive guide possible to the munias and mannikins genus *Lonchura*. For example, every species, subspecies and distinct female and juvenile will be illustrated in colour, and there will be many drawings aiding sexing and showing behaviour, etc. However, there are inevitably some blank areas, and these can only be filled by help from aviculturists who have kept or are keeping the birds. I would be more than grateful for any munia enthusiast with experience, however slight (it's amazing how even the smallest item of information can help) of the following species would write to me please: *Lonchura leucogastra* (white-bellied), *L. monticola* (Alpine), *L. vana* (New Guinea Grey-headed), *L. montana* (Snow Valley), *L. tristissima* (Streaked-headed), or any other unusual munia.

"Further to my notes on *L. quinticolor* in "Reminiscences of Munias" (Vol. 95, Nos. 3 and 4). I have established that the bird with the golden rump is *L.q. quinticolor* from Timor. The maroon-red-rumped bird is *L.q. wallacii* from Bali and Lombok. I will write further about this species in due course."

* * *

Mats Tell writes from Sweden with his breeding results for 1989.

"After yet another very mild winter, most of my birds were eager to go to nest. In fact, the first eggs of the season were produced by a hen Little Masked Weaver at the end of March.

"The warm and sunny summer seems to have had a good effect on

most gamebirds. A possible Swedish first breeding of the Hazelhen is worth mentioning and a good number of Blackcock, Ptarmigan and Capercaillie were bred. The latter is now being produced in such large numbers that some breeders have problems in selling their surplus stock. Brown Eared Pheasants and Satyr Tragopans also did well.

I had true pairs of 17 species. Out of these, 14 went to nest but only nine were successful. The following young birds were reared: Chinese Painted Quail 6, Bourke's Parrot 20, Little Masked Weaver 1, Jacarini 2, Red-legged Honeycreeper 2, Chestnut Sparrow 2, Orange-cheeked Waxbill 7, Pearl-headed Silverbill 3, and Orange-breasted Waxbill 2."

* * *

Dave Coles writes from Pangbourne: "During 1988 I had the chance to visit the Burwood Bush Takahe Rearing Unit, New Zealand. Seven young were being reared at that time by Daryl Easom of the Department of Conservation. In a recent letter, Daryl reports that the 1989/90 breeding season promises to be a good one for the Takahes. At the Centre, twelve chicks are being hand-reared using a puppet of an adult to assist, and another six eggs are being incubated. Daryl also reports that at least one pair of released birds have a chick, as does one of the captive pairs which was retained from the previous year's successes.

"Daryl's work has yielded valuable information on the rearing and rehabilitation of this endangered species and it is hoped that a summary of his findings will appear in a future issue of our magazine."

* * *

THE AVICULTURAL SOCIETY

The Avicultural Society was founded in 1894 for the study of British and foreign birds in freedom and captivity. The Society is international in character, having members throughout the world.

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The subscription rate for non-members is: British Isles £16.50; Overseas £18.00.

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THE AVICULTURAL MAGAZINE welcomes original articles that have not been published elsewhere and that essentially concern the aviculture of a particular bird or group of birds, or that describe their natural history. Articles should be preferably typewritten, with double spacing, and the scientific names as well as the vernacular names of birds should be given. References cited in the text should be listed at the end of the article. Line drawings should be in Indian ink on thick paper or card; black and white photographs which illustrate a particular point in the article will be used where possible and should be clearly captioned. If authors wish their eventual return, they must say so when submitting the article and write their name on the back of each photograph.

ADDRESS OF EDITOR

Mary Harvey, Honorary Editor, The Avicultural Magazine, Warren Hill, Hulford's Lane, Hartley Wintney, Hampshire RG27 8AG, England.



C. Vere

Two young Snowy Owls bred at Chester Zoo.

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CHESTER ZOO 1987 - 1989: SOME OBSERVATIONS ON BIRD-REARING AND ARRIVALS TO THE COLLECTION

By ROGER WILKINSON
(Curator of Birds)

Over the three year period 1987 to 1989, 96 species of birds were reared from a total of 109 species which hatched chicks. Some species were successful in one year but not in another and several species that bred in earlier years are no longer represented in the collection. Our best year for breeding results was 1988 when 65 species reared a total of 269 chicks. However, where artificial incubation and rearing were involved, this over-stretched our resources and in 1989 we were more selective in our choice of species for intensive husbandry.

Ostriches *Struthio camelus* were hatched in 1987 and 1988 but only one was reared to maturity. Since then both partners of our breeding pair have died; the female after 19 years in the collection. However, several of their 11 offspring from 1984 have now themselves become breeders including a female at Paignton Zoo which reared chicks in 1989.

Our Emus *Dromaius novaehollandiae*, hatched and reared a batch of sixteen young in 1988. It proved so difficult to place these youngsters that we prevented them breeding by removing all their eggs in 1989. Common Rheas *Rhea americana* reared chicks in all three years. A recent male Rhea received on loan from Paignton Zoo proved a model parent in defence of his young. We were concerned that the Rhea chicks may have been taken by a problem Fox *Vulpes vulpes* but having seen the proud father "defend" his progeny from the Guanaco *Lama guanicoe* and Chinese Water Deer *Hydropotes inermis* which share the paddock, quickly realised there was little need for concern.

Chilean Tinamous *Nothoprocta perdicaria* continue to be bred. From our original stock of four birds imported in 1980 a total of over 160 have now been reared, of which the majority have been sent to other zoos and private collections. With such a small number of founders it will be interesting to see how long this population may succeed.

In the last three years our flamingo flock has grown by breedings and acquisitions from 24 Caribbean Flamingos *Phoenicopterus ruber* and 18

Chilean Flamingos *P. chilensis* to a total of over 70 birds. Details of breedings up to 1988 were reported in a previous article in the Avicultural Magazine (Wilkinson, 1989). A further three Caribbeans were reared in 1989 when we had our first success in hatching and rearing a Chilean Flamingo. Work is currently progressing in building a new area to permit the Chileans to be held separately from the Caribbeans. Last year three hybrid pairs were observed, each of which was prevented from hatching hybrids by egg removal and replacement with either wooden dummies or abandoned eggs from non-hybrid pairings.

Night Herons *Nycticorax nycticorax* and Sacred Ibis *Threskiornis aethiopicus* both reared young in the big flight in 1988. It was therefore with some regret that these birds, together with our Silver Gulls *Larus novaehollandiae* and Grey-headed Gulls *Larus cirrocephalus* were moved to Penscynor in early 1989 in order that the endangered Waldrapp Ibis *Geronticus eremita* could have sole occupation of the flight. Our colony now comprises some 20 Waldrapp, the majority of which are still too young to breed, although several pairs laid eggs in 1988 and 1989.

We had hoped that the Sacred Ibis could be used as fosters for the more difficult Waldrapps. Although this was attempted in 1988 the more robust Sacred Ibis proved to be too much of a nuisance in disturbing the Waldrapps by stealing their nest material. The attempt at cross-fostering however was instructive. In 1988 a pair of Waldrapps which hatched a chick from their first clutch re-nested at the same time as one of the Sacred Ibis pairs. The Waldrapp chick had died shortly after hatching, apparently not fed by its parents. We therefore swapped eggs between the two species. The Sacred Ibis proved better parents than the Waldrapps in hatching two chicks and rearing one to five days. Post-mortem indicated that this Waldrapp chick had been fed with sand and gravel resulting in impaction of the proventriculus. The Waldrapp amazed us by hatching and successfully rearing the Sacred Ibis chick. It would seem that Sacred Ibis chicks are more robust than the Waldrapps. Hoping that this experience in rearing had been beneficial to the Waldrapps we gave them another chance in 1989. However, although three chicks were hatched, all again died within days of hatching.

If captive Waldrapp Ibis are to be used in reintroduction programmes then parent-reared birds are likely to be a better proposition than those that are hand-reared. Although our target is to establish a Waldrapp colony sustainable by parent-rearing it seems we may have to hand-rear, at least in the short-term, if we are to maintain our colony at its present numbers.

Our policy of hand-rearing Humboldt Penguins *Spheniscus humboldti* which resulted in 16 chicks reared in 1986, has continued with 13, 19 and 8 chicks respectively hand-reared in the last three years. Perhaps we should now again be addressing the question of why the parents previously failed in rear-



Barn Owl chick at Chester Zoo, one of 56 bred in the period 1987-89 as part of a co-ordinated captive breeding/re-introduction programme.

ing their own chicks, although at least at present our concern is to maintain a captive population without the complications of the needs of reintroduction programmes.

White Storks *Ciconia ciconia* on loan to us from Bristol Zoo, bred for the first time at Chester in 1989. Three chicks were hatched of which two were successfully reared. Because we had not observed the parents feeding the chicks we decided to assist by supplementary feeding of the youngsters in the nest. Accordingly over the first week the chicks were fed by syringe with Penguin hand-rearing mixture, essentially liquidised sprats with vitamin and mineral supplements. This food was later left on the side of the nest. The chicks readily accepted this method of presentation which we later discovered mimicked the feeding behaviour to the nestlings of the adults. Concern was felt when one of the parents was seen to attempt to feed the chicks on vegetable material that looked like grass clippings, but could have been algae from the side of their pond. No mention of vegetable food is given in recent literature. Cramp and Simmons (1977) note that the diet of White Storks is 'exclusively animal' reporting that wild nestlings are fed initially on grasshoppers and lizards and later on frogs and snakes. Similarly Brown et al (1982) record the White Storks diet as being 'entirely animal'. Our fear that the feeding of vegetable matter by the parents to the chicks might result in impaction of the alimentary canal was not unfounded. The chick that died, at an age of thirteen days, on post mortem was found to have its proventriculus impacted with vegetable material.

Black Swans *Cygnus atratus* reared cygnets in 1987 and 1988 but in the latter year the male became increasingly aggressive to the public and the pair were replaced by a young pair of Black-necked Swans *Cygnus melanocoryphus*. Also new to the collection in 1988 was a group of Baikal Teal *Anas formosa*. Hawaiian Geese *Branta sandvicensis*, Red-breasted Geese *Branta ruficollis*, Emperor Geese *Anser canagicus* and Ruddy-headed Geese *Chloephaga rubidiceps* were reared, as was a single Cereopsis Goose *Cereopsis novaehollandiae*.

Ducks bred included White-faced and Fulvous Tree Ducks *Dendrocygna viduata*, *D. bicolor*; Laysan, Ringed and Marbled Teal *Anas platyrhynchos laysanensis*, *Calonetta leucophrys*, *Marmaronetta angustirostris*; Chiloe Wigeon *A. sibilatrix*, Shoveler *A. clypeata*, Common Shelduck *Tadorna tadorna*, Tufted Duck *Aythya fuligula*; Rosy-billed and Red-crested Pochard *Netta peposaca*, *N. rufina*; Mandarin and Carolina Wood Ducks *Aix galericulata*, *A. sponsa*.

We were especially pleased to have our first breedings of White-winged Wood Ducks *Cairina scutulata*, Ruddy Ducks *Oxyura jamaicensis* and Hooded Mergansers *Mergus cucullatus*. Normally held in a separate side-pen one of the White-winged Wood Ducks repeatedly escaped from this pen into



C. Vere

White Stork, with two chicks, at Chester Zoo.

the main waterfowl lake in 1988. After a series of deaths of adult Hooded Mergansers the culprit was finally found to be this White-winged Wood Duck. It was caught in the act of attempting to drown a Ruddy Duck that had just hatched off a clutch of youngsters. Endangered but dangerous to other ducks, we were nonetheless extremely pleased to rear four young White-winged Wood Duck from the parents entrusted to us by the Wildfowl Trust.

Three Andean Condors *Vultur gryphus* were hand-reared in 1987. After having hand-reared six Condors over the previous three years we decided in 1988 to leave the first egg with the parents. This was duly incubated but did not hatch and the parents did not lay again. In 1989 we removed the two eggs laid, only the first of which was fertile. The chick hatched from this egg was puppet-reared, puppet models of both mother and father Condor being produced by our Education Department. Young from our breeding pair of Condors are now held at the Falconry Centre (Newent), Colwyn Bay Zoo and Chessington Zoo as well as at Antwerp and Rotterdam Zoos. It is hoped that number seven will be flown to Moscow in 1990.

Sclaters Crested Curassow *Crax fasciolata sclateri*, a subspecies of the Bare-faced Curassow was first bred at Chester over 20 years ago. After some years with little further success in breeding from these Curassows we finally succeeded in hatching chicks in 1988. Eight chicks were hatched of which six were reared; all six were males, one was retained at Chester and others sent to Rotterdam Zoo and Keith Howman. In 1989 a further four chicks were reared. This time they proved to be two pairs and all four birds are now at Paignton Zoo. Variable Chachalacas *Ortalis motmot* also bred at Chester, one chick being hand-reared in 1988 and another parent-reared in 1989.

Pheasants reared over the three year period included White Eared Pheasants *Crossoptilon crossoptilon*, Grey Peacock Pheasants *Polyplectron bicalcaratum*, Palawan Peacock Pheasants *P. emphanum*, Himalayan Monals *Lophophorus impeyanus* and Golden Pheasants *Chrysolophus pictus*. New arrivals over the same period included pairs of Congo Peafowl *Afropavo congensis* on loan from Antwerp Zoo, Edwards' Pheasants *Lophura edwardsi* from Jersey Wildlife Preservation Trust and Lady Amherst's Pheasants *Chrysolophus amherstiae* from Rode. Of all our Pheasant species the Congo Peafowl is the one we most wish to rear. We have had a series of clutches from the Congo Peafowl but all except one have been infertile and these failed to hatch.

A pair of White-naped Cranes *Grus vipio* were received from Rotterdam in 1988. The male, a hand-reared bird originally from Walsrode, is extremely aggressive to keepers and greatly enjoys chasing them before returning to his shy partner and displaying proudly with loud trumpeting calls. More recently we have brought together four pairs of Black Crowned Cranes *Balearica pavonina pavonina*. Four of these birds are on deposit from Barcelona Zoo



C. Vere
Bare-faced Curassows. One of the birds reared in 1988

and others have been loaned by Paradise Park at Hayle and Joe Blossom. In co-operation with the Tropical Bird Gardens, Rode, who have had previous success with this species, we are presently trying to sort out compatible pairings from our joint holdings. The Black Crowned Crane, although not presently a "listed" species, is becoming increasingly scarce in many parts of its West African range. Once breeding regularly in Nigeria, and that country's national bird, it is unlikely that any now breed within the country's borders. Sarus Cranes *Grus antigone* which we bred for the first time in 1986, were reared by bantams in each of the last three years. After deaths of chicks left with the parents in 1987 and 1988 we were delighted when they finally succeeded in rearing a chick in 1989. That chick, hatched from the second clutch some three weeks later than the one fostered by the bantam, soon outgrew its bantam-reared sibling and proved to be a most magnificent youngster.

Crowned Plovers *Vanellus coronatus* and Blacksmith's Plovers *V. armatus* were also bred. The parent-reared Crowned Plovers grew faster than their hand-reared counterparts. Perhaps this resulted from our deliberately limiting the amount of protein fed to the hand-reared birds whilst we had less control of the diet of the parent-reared youngsters. Past problems with leg deformities have often been put down to too rapid growth resulting from excess protein and so we carefully control the diets of hand-reared birds. That these problems in leg growth occur less in parent-reared birds, even though these grow faster, may be related to the extra exercise the latter get in their more natural environment. While bantams so often prove good fosters, they also have their problems. The only Little Black Bustard *Afrotis atra* which was hatched in 1988 was fatally attacked by its bantam foster parent soon after hatching.

A very exciting breakthrough was our first hatching of a Pink Pigeon *Nesoenas [columba] mayeri* in 1988. The Pink Pigeon chick was hatched by domestic pigeon fosters but died at about ten days old. Sadly although eggs were laid by the Pink Pigeons in 1989 few were fertile and none was hatched.

Mountain Witch Doves *Geotrygon versicolor*, Bar-tailed Cuckoo Doves *Macropygia unchall*, Crested Pigeons *Ocyphaps lophotes* and Laughing Doves *Streptopelia senegalensis* were bred and recent arrivals include three species of *Gallicolumba*; Golden Heart Doves *Gallicolumba rufigula*, Luzon Bleeding Hearts *G. luzonica* and Celebes Quail Doves *G. tristigmata*. The Luzon Bleeding Hearts proved on surgical sexing to be three females. One was sent on breeding loan to Paignton Zoo from which in 1989 two chicks were reared; you guessed it, these were both females! Celebes Quail Doves have settled well in the free-flight of our Tropical House but have recently become aggressive to each other and dominant over the smaller Mountain Witch Doves. A pair of Celebes Quail Doves nested in December 1989 but the single egg was balanced precariously on a flimsy nest of a few leaves and soon became a victim of the law of gravity. Other recent arrivals include Emerald Doves

Chalcophaps indica from Paignton Zoo and Common Bronzewing Pigeons *Phaps chalcoptera* from the Tropical Bird Gardens at Rode.

Lories and Lorikeets presently held in the collection include Duyvenbode's Lory *Chalcopsitta duivenbodei*, Yellow-backed Chattering Lory *Lorius garrulus flavopalliatu*s, Musk Lorikeet *Glossopsitta concinna*, and Musschenbroek's Lorikeet *Neopsittacus musschenbroekii*. Yellow-backed Chattering Lories hatched but failed to rear chicks in 1989.

Musk Lorikeets have proved willing nesters but difficult to rear successfully. Since 1987 our breeding pair has nested two or three times each year but only four chicks have fledged. One of these bred in 1988 was parent-reared to fledging then removed from the aviary because of aggression from its parents which clearly wanted to re-nest. This bird was caged and quickly became independent but then died several weeks later after being placed in an outside aviary. Post mortem indicated ascites and hepatic failure as the cause of death. A second young which fledged in 1989 died as a result of an enteritic infection through *Escherichia coli*. Accordingly when the next two youngsters fledged they were immediately removed from the parents' aviary and transferred to a box cage where they could be closely monitored.

The same thing happened with Musschenbroek's Lorikeets which reared two chicks in 1989 only to attack these shortly after fledging. Again these youngsters were quickly removed to the safety of a box cage. Goldie's Lorikeets *Trichoglossus goldiei* were bred in 1987 but were then moved out of the collection in order to create space for Papuan Lorikeets *Charmosyna papou*, a female of which is on loan to us from Mr Raymond Sawyer. Comparisons of our birds with specimens from the British Museum suggest that they are of the subspecies *C. p. goliathina* rather than *C. p. stellae* as commonly assumed.

New Psittacine arrivals include a pair of Thick-billed Parrots *Rhynchopsitta pachyrhyncha*, one from Ken Dolton and the other from Jersey Zoo; a pair of Blue and Yellow Macaws *Ara ararauna* which bred in their first year at Chester and again in 1989; and most recently two captive-bred Green-cheeked Amazons *Amazona viridigenalis*. Lesser Vasa Parrots *Coracopsis nigra* have bred in each of the last three years but success with the Greater Vasas *Coracopsis vasa* has consistently eluded us. Our female lays infertile eggs annually outside the nest box in which she otherwise spends the greater part of her time. Compatibility appears to be a problem and so we have recently purchased a second pair of Greater Vasas. Once they have settled it is our intention to house all four birds together and allow them to select their own mates. Other parrots bred in the collection were Derbyan Parakeets *Psittacula derbiana*, Barraband Parakeets (Superb Parrots) *Polytelis swainsonii*, Red-masked Conures *Aratinga erythrogenys*, Lesser Patagonian Conures *Cyanoliseus patagonus* and Yellow-faced Parrotlets *Forpus xanthops*.

In aviculture things are often not what they first seem. This was certainly the case with our Palm Cockatoos *Probosciger aterrimus* which for several years we had considered to be two large males and a small female. What we in fact had were two males of the large subspecies *P. a. goliath*, and one of the smaller *P. a. aterrimus*. Now after a number of exchanges and the transfer of one of our males on breeding loan we hold a pair of the smaller subspecies. Similar problems occurred with Red-fronted Macaws *Ara rubrogenys*, of which a number placed with us by Customs & Excise were all surgically sexed as females. Jersey Zoo kindly loaned us a surgically sexed male. We were really pleased when after several years with no breeding attempts, the Jersey bird and its mate produced a clutch of two eggs in 1988. However, we could not understand why only the Jersey bird was seen to incubate the eggs, this seemed unusual for a male. The eggs were infertile and at the end of the breeding season our worst suspicions were confirmed when the Jersey bird was resexed and found to be a female. After a series of exchanges brought about by reciprocal breeding loans, we now hold two sexed pairs of Red-fronted Macaws at Chester.

A recurrent problem in keeping Touracos at Chester has been that of infection by *Yersinia pseudotuberculosis*, especially presenting a problem during the winter months in our arcade aviaries. In our experience White-cheeked Touracos *Tauraco leucotis* have proved less susceptible than other species and it is therefore not surprising that this has been the first species of touraco bred at Chester, one chick being reared by its parents in 1989. Both birds behaved amicably until the chick was three weeks old when the male had to be removed because of aggression towards its mate. This created the opportunity to split two sibling pairs. Whereas one of the newly formed pairs now seems settled, the other two birds, which were introduced together some six months ago, still persistently avoid each other.

Two pairs of Barn Owls *Tyto alba* reared a total of fifty-six chicks over the last three years. In conjunction with a local release programme, co-ordinated by Dr Carol Hackney and given a Royal Society for Nature Conservation award in 1986, these were released at carefully chosen sites in North West England. Monitoring at these release sites has indicated recent Barn Owl breeding suggesting at least some success in this project, and one of our Owls is now breeding on the Wirral, where the only three breeding pairs all resulted from captive-breeding and release projects.

Other Owls bred include Spectacled Owl *Pulsatrix perspicillata*, Great Horned Owl *Bubo virginianus*, Great Eagle Owls *Bubo bubo* and Snowy Owls *Nyctea scandiaca*. Our female Vermiculated Fishing Owl *Scotopelia bouvieri*, which arrived at Chester in 1969, has remained unpaired since that date. Considering that she was then too old to breed and having been unable to find her a mate of her own species, she shared her aviary with an elderly

Spectacled Owl in 1989 and surprised us all by laying two eggs!

White-faced Scops Owls *Otus leucotis* have been a particular favourite of mine since one lived under my bookcase in Kano, Nigeria. That particular owl had been saved from the stoning of local boys who believed owls to be evil. I was thus more than delighted when in November 1989 two of these beautiful little owls came to Chester on deposit from London Zoo.

Kookaburras *Dacelo novaeguineae* have continued to breed well, rearing chicks annually. White Woodpeckers *Leuconerpes candidus* on deposit at Chester from Rotterdam Zoo reared three chicks in 1987 and five chicks in two broods in 1988. The two youngsters from the first brood were tolerated by the parents during their second nesting cycle, and indeed assisted in feeding the three second-brood chicks. These appear to be the only recorded breedings of this Woodpecker in the UK in the fifty years since Alfred Ezra was awarded an Avicultural Society medal for the first captive breeding.

Crimson-rumped Toucanets *Aulacorhynchus haematopygus* reared three chicks in 1987. In 1988 four chicks were hatched but did not survive following the death of the female parent after aggression by the male. We have since been unable to find a partner for our male. Collared Aracari *Pteroglossus torquatus*, new to the collection in 1988, had two clutches of eggs in 1989 but all were infertile. Aggression from the male towards the female subsequent to these failed nesting attempts has prevented us getting these birds together again. Channel-billed Toucans *Ramphastos vitellinus* reared two chicks in 1989. Details of this breeding and of the rearing of African Grey Hornbills *Tockus nasutus* in 1988 and 1989, and Trumpeter Hornbills *Bycanistes bucinator* in 1989 are being prepared separately for this journal. Recent additions to the collection from the Coraciiformes include Rhinoceros Hornbills *Buceros rhinoceros* and European Rollers *Coracias garrulus*.

Passerines bred in the Bird House and adjacent arcade aviaries included White-crested Laughing Thrush *Garrulax leucolophus*, Red-tailed Laughing Thrush *Garrulax milnei*, Coleto Mynah *Sarcops calvus*, Superb Spree Starlings *Spreo superbus*, San Blas Jay *Cissilopha sanblasiana* and Azure-winged Magpies *Cyanopica cyana*. Following a series of unsuccessful breeding attempts in 1988 three Azure-winged Magpie nestlings were removed when half-feathered to be finished off by hand-rearing. Since then reciprocal breeding loans between Chester and the Tropical Bird Gardens, Rode have resulted in second-generation breedings at both Zoos. We were particularly satisfied that our hand-reared female proved a model parent to her first brood in 1989 and that her parents also reared their own chicks that year.

The strategy of removing Rothschild's Mynahs *Leucopsar rothschildi* at about five days old for hand-rearing was adopted in 1987. One chick was hand-reared in 1987, two in 1988 and three in 1989. Blue-winged Pittas *Pitta brachyura*, Plumbeous Redstarts *Rhyacornis fuliginosus* and Royal Starlings

Cosmopsarus regius were presented to the Zoo by Customs & Excise in 1988, and are exhibited in the upper aviaries of the Tropical House. A pair of Fire-fronted Bishops *Euplectes diadematus* were purchased in 1988 as "out of colour" Napoleon Weavers *E. afer*. Robin Restall (1975) notes that this is a species he had never seen so we must indeed consider it scarce in aviculture. Birds bred in the aviaries or the free flight of the Tropical House included Roulroul Partridge *Rollulus roulroul*, Californian Quail *Lophortyx californica*, Red-backed Mousebird *Colius castanotus*, Orange-headed Ground Thrush *Zoothera citrina*, Pekin Robin *Leiothrix lutea*, Silver-eared Mesia *L. argentauris*, Blue-grey Tanager *Thraupis episcopus*, Red-eared Bulbul *Pycnonotus jocosus*, Red-cowled Cardinal *Paroaria dominicana*, Fairy Bluebird *Irena puella*, Java Sparrow *Padda oryzivora*, Long-tailed Glossy Starling *Lamprotornis caudatus* and Purple Glossy Starling *L. purpureus*.

More notable was the rearing of Ashy Starlings *Cosmopsarus unicolor*, we believe for the first time in the UK, as also may be the breedings of White-headed Buffalo Weavers *Dinemellia dinemelli* and Golden Palm Weaver *Ploceus bojeri*. Both the Weaver species nested in the free-flight of the Tropical House constructing their nests in the large Palm Trees. The White-headed Buffalo Weavers built a large communal structure in the crown of one of the Palm Trees. This appeared to be a single entity with three separate nest holes and was built mainly of dry strips of vegetation. Following the breeding attempt from which one chick successfully fledged a portion of the nest fell down. On inspection this resembled a hollow ball of hay, of perhaps 20 cm diameter. Clearly the larger nest was constructed from a number of these units. This contrasted with the more substantial structure built of larger twigs by the Red-billed Buffalo Weavers *Bubalornis albirostris niger*. The Golden Palm Weavers suspended their nests from the fronds of Palm Trees usually above water areas. At least three broods fledged in 1989 and after each one, that nest was then destroyed by the Weavers.

First breedings are fun and serve to extend our avicultural knowledge and experience, especially where they involve families or genera not previously bred in captivity. However, our priorities should be to establish captive stocks of those species endangered in the wild. A recent report published by the International Council for Bird Preservation suggested that over a thousand species of birds are threatened in the wild and very few of these can be considered as established in aviculture. At Chester Zoo we face many challenges with the husbandry of endangered species recently entrusted to our care and in co-operation with other zoos and private aviculturists hope that we can help in furthering the cause of captive breeding for conservation in the 1990's.

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As described above Chester Zoo has bred the following species:

African Grey Hornbill	<i>Tockus nasutus</i>	in 1988
Musk Lorikeet	<i>Glossopsitta concinna</i>	in 1988
Trumpeter Hornbill	<i>Bycanistes bucinator</i>	in 1989
Ashy Starling	<i>Cosmopsarus unicolor</i>	in 1989
White-headed Buffalo Weaver	<i>Dinemellia dinemelli</i>	in 1989
Golden Palm Weaver	<i>Ploceus bojeri</i>	in 1989
Channel-billed Toucan	<i>Ramphastos vitellinus</i>	in 1989

and these are believed to be first successes in this country. We hope to publish full accounts of these breedings in future issues.

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THE BLACK-EARED OR MENNELL'S SEEDEATER

Serinus mennelli

by F. C. BARNICOAT
(Johannesburg, South Africa)

The Black-eared Seedeater has never figured in aviculture outside of Zimbabwe or South Africa. I have never seen reference to it in any book on aviculture except Robin Restall's excellent work *Finches and other Seed-eating Birds*. His description and facts given for the Mennell's Seedeater are accurate, but they are given under the heading "Brown-rumped Seedeater *Serinus tristriatus* (p 108) and this is an entirely different, not a synonymous species, which comes from north-eastern Africa. Mr Restall, too, states that he has no avicultural reference for the Mennell's. As I did at least keep the Mennell's Seedeater for some years, I feel that an article on it may be of some interest in the Avicultural Magazine.

Like its obviously very close relative the Streaky-headed Seedeater, which is a common and widely distributed species in Africa south of the Sahara and is widely kept in captivity in Southern Africa anyway, the infinitely rarer Mennell's is a quietly coloured bird, attractively marked in shades of grey and white. Both have the characteristic whitish head attractively streaked with black markings, but the Mennell's has a wider, more striking white eye-brow, and the impressive black cheek patch. I might here warn that the plates in Mackworth-Praed and Grant also depict black cheek patches on the Streaky-headed Seedeater, but this is not the case and apt to be misleading. The contrasts in white, grey and black on the Mennell's are far more striking than the more muted grey tones of the Streaky-headed Seedeater. I am hoping it may be possible to print a photograph of these birds, because even black and white photography readily gives an exact impression of what they look like. An excellent coloured plate of the Mennell's Seedeater by D. M. Henry was published in Skead's "The Canaries, Seedeaters and Buntings of Southern Africa.

The relatively close resemblance of the Streaky-headed and the Mennell's Seedeater, coupled with the fact that in Zimbabwe they are sometimes found in the same area, has occasionally given rise to confusion, and I came across a fancier in Zimbabwe who was keeping a Black-eared and a Streaky-headed Seedeater, both males, in an aviary, as he was under the impression that the latter was a female of the former. A statement in most of the editions of Roberts' *Birds of South Africa*, that the females "have brown cheek patches" has also led to much confusion. They certainly do not have brown cheek patches and in fact sexual dimorphism is not strong in them, the females being slightly smaller on average and with the streaks on the head and the sides of the face a duller black. Her plumage is generally somewhat paler than the



Mennell's Seedeater, male

N. Brickell

male's, but there is no specific difference.

The Black-eared Seedeater was not recorded until 1908 when specimens were shot by E.C. Chubb at Tjoko's Kraal, Shangani River, Southern Rhodesia. A specimen was sent to the British Museum and Dr Bowdler Sharpe suggested that it be named after F.P. Mennell, a well-known Consulting Geologist and Mining Engineer of Bulawayo, who had defrayed the expenses of the expedition undertaken by Mr Chubb, and who had collected many birds for the Rhodesian Museum.

The Black-eared Seedeater is almost purely a Zimbabwean species spilling over slightly into Mozambique, Malawi, Zambia and Zaire, but not southwards across the Limpopo River into South Africa. Though its distribution is quite extensive, it is very patchy. It may be quite common in very restricted areas, yet disappear from them in another season. It appears to be a bird of the arid thornbush country and Belcher said that it was found on wooded, rocky hillsides never below 3,000 feet. Unlike the Streaky-headed Seedeater it appears to shun cultivated ground and be found in the wilder areas.

Mackworth-Praed and Grant state that in the breeding season the males have a courtship flight consisting of an upward flight to some considerable height and then a series of swerving dives interspersed with butterfly-like flaps, and that the song is always given from the top boughs of tall trees. It has been suggested to me that they might, therefore, be very difficult if not impossible to breed in captivity. My experience of keeping them, however, would indicate that they adapt very readily to life in an aviary, and I feel certain that if pairs could be obtained and given reasonable accommodation they would breed well.

In April 1981 I was sent two Black-eared Seedeaters by a fancier in Zimbabwe, and during a holiday there in July 1987 I obtained more from someone else. As luck would have it, all five were males. They lived happily and peaceably in my aviaries for several years. Unfortunately it proved impossible to obtain a female, so I acquired two Streaky-headed Seedeater hens, but I could never get even one of the Black-eared males to show the slightest interest in either of them. When keeping the two species together in aviaries, despite their similarities in appearance, subtle differences in their habits became apparent. Their flight patterns were different, and the Black-eared preferred more open perching. One of the difficulties of keeping the Black-eared was that they had a rooted objection to using my aviary shelters. They thrived on the usual dry seeds, green foods, of which they were particularly fond, and soaked sunflower seed. With the passing of time they became quite tame, and at times the cocks came into obviously high breeding condition and uttered a pleasant song. The last surviving one escaped when I accidentally failed to fasten an aviary door in 1988, by which time he had lived in my aviaries for over six years.



S. N. Shillinglaw

(above) Streaky-headed Seedeater, male.

(below) Mennell's Seedeater, male.

Both birds owned by F. Barnicoat



N. Brickell

Pair of Mennell's Seedeaters, female on left.

In the 1950s, 60s and 70s the keeping of wild birds was in a thriving state in Rhodesia, and though these birds have never been readily obtainable by the aviculturist, I have absolutely no doubt that some of the many Rhodesian fanciers must have kept and even bred the Mennell's Seedeater. Most of these breedings would have gone unrecorded, but it is possible that a success might have been listed amongst others by the few Rhodesian fanciers who wrote in publications like *Foreign Birds*.

Very few Mennell's Seedeaters have ever been brought south of the border to the Republic of South Africa. However Neville Brickell observed a breeding of the Black-eared Seedeater in a Durban fancier's aviary in January 1966. The nest was cup-shaped, built of coir and plant matter, and placed in the fork of a mulberry tree 8ft from the ground. The incubation period was 13 days and three young ones left the nest at 18 days old. Neville Brickell himself had previously bred a hybrid from a Streaky-headed male and a Black-eared female, which he had obtained from a canary breeder who had tried to breed mules from it in 1963 and 1964 unsuccessfully. It was placed in an aviary with two male and one female Streaky-headed Seedeaters, and in 1965 it laid a clutch of three eggs of which two were clear. The other egg hatched and the young hybrid was successfully raised. (pers. comm.).

The advent of the guerilla war in Rhodesia seriously curtailed avicultural pursuits, and subsequently many of the prominent bird keepers emigrated. At present the chances of ever acquiring the Black-eared Seedeater again seem remote, but it would be nice to think that in due course aviculture in Zimbabwe might get back to its former standard, and that this totally delightful aviary bird might again be kept and bred in captivity.

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THE GOLDEN CONURE IN FIELD AND AVIARY

by TONY SILVA
(Loro Parque, Tenerife, Spain)

"If God had created a paradise specially for birds, then it would surely have been Brazil: the number of species found there is so great, the beauty of their plumage and song is such, their joy in simply being and in peopling the fields and forests of this immense land is so obvious that it is difficult to imagine anywhere else on earth which would be more welcoming to birds in all their needs."

Augusto Ruschi, 1984, *Aves do Brasil*, volume 2

No one who has seen some of Brazil's parrots in field or aviary would be apt to argue with the above by Augusto Ruschi. Examples well known to readers would include the magnificent Hyacinthine Macaw *Anodorhynchus hyacinthinus*, a species that was once common but which is now endangered – perhaps even on the brink. To see it disappear altogether from the wild would be a tremendous loss. So too, would be the extirpation of the Golden or Queen of Bavaria's Conure *Aratinga guarouba*, whose bright yellow plumage with green remiges, morphology and intelligence (something that could even be described as "presence"), give it no equal in the avian world. Indeed, it is so distinct from other parrots that it has no close relatives or geographic variants. This taxonomic isolation strongly suggests that it deserves being placed in its own genus. Resurrecting Lesson's *Guarouba* would be the most logical solution, for even its Portuguese name of Ararajuba (Arara = macaw, juba = yellow) denotes that it is not a typical conure. To lose this spectacular jewel would be a very great loss but, alas, this may be its destiny.

The Ararajuba is presently restricted to north-eastern Brazil, south of the Amazon River, from the west bank of the Rio Tapajós, Pará, east to north-western Maranhão. There are reports that it once extended farther east, possibly even to Ceará, yet this seems unlikely and currently impossible. To the east of the known range, there is the "Zona Bragantina". This area lies 300 km east of Belém, the capital of the state of Pará, where the mighty Amazon meets the Atlantic ocean, and is known for having been totally cleared of its original growth - a nadir comprising 30,000 sq. km., where few parrots survive.

The Bragantina was colonised over 100 years ago by immigrants from the drought-scorn and dirt-poor cow country of the Brazilian north-east as well as Spain, Portugal, France and the Azores. For a few years, all prospered and a railroad was built, but then crops of rice, corn and cassava failed. Virtually all colonists drifted away, the railroad closed and the Arcadia of the neotropics

was left as a desolate spot on the map. (Stone, 1985, *Dreams of Amazonia*, New York: Viking Penguin) One would think that the Bragantina taught a serious lesson to man, but it did not and schemes which dwarf it are now in progress; these will fragment the remaining habitat of *guarouba* severely and could ostensibly seal its fate in doom.

This eastern part of the range is under the greatest of pressure. The Gurupi area where Paul Roth observed several specimens in 1983 is one such example. It is in the midst of colonisation from eastern Maranhão and Pará, and an area 1.6 million ha. decreed in 1961 as a national park (but never implemented) has now largely been colonized by cattle ranches and timber companies. Information such as this was undoubtedly used by David Oren and Fernando Novaes (1986, *Biological Conservation*, 36:329-337) when they wrote that the Golden Conure will "be extinct in Maranhão by 1990 and the rest of the region east of the Tocantins by [the year] 2000".

The western part of the range offers more hope, particularly an area in which *guarouba* was recently found and from which it was unknown. Authors have consistently given the western limit as the Xingu River, Pará, until Olivéiro M. de Oliveira Pinto published his *Novo Catálogo das Aves do Brasil* in 1978. In it he extended the range to the Tapajos River, this information being based on a specimen obtained by Alfonso Olalla at Fordlândia in 1962. Previous failures of collectors to obtain specimens in this area are explained by their habit for many years of remaining on the more passable rivers and not venturing upland. The Trans-Amazon Highway, which now extends from Belém south-west into Cruzeiro do Sul, almost near Perú, has made records in the new locality possible. Oren and Willis (1981, *Auk*, 98:394-396) recorded groups near Itaituba, on the west bank of the Tapajós, and as far away as between this locality and Altamira.

The western limit falls within the 1 million ha. Tapajós National Park, the only such reserve in Pará state. However, this area would not be sacrosanct if minerals were found, and already squatters have commenced clearing the land. Plans initially called for 250 individuals to staff the headquarters planned for an area overlooking the forest and river, but when I was last in Brazil (1987), an individual employed by the superintendency of the Amazon (SUDAM) told me that there were only a half dozen workers and that patrolling had not yet commenced. He added, however, that a hilltop had been flattened so that the planned building could someday be constructed.

Pressures on the species occur even near the central section of the range. Consider Tucuruí, a town on the left bank of the Tocantins River. Between 7-19 June 1980, Oren (in Oren and Willis, loc. cit.) sighted groups of seven to twelve daily and on the 20th a band of 27 flew over Tucuruí, but this same area would soon be lost as a feeding and nesting site for it was to be the site of a massive hydroelectric project, part of the Grande Carajas scheme.

W. R. Kingston provided me with details of the damage this project is likely to cause. Starting in October 1984, flooding commenced and inundated an area of 2400 sq.km, save for some 600 islands. These islands, ranging from a couple to several hundred square kilometers in size, were expected to alleviate the pressures put on the wildlife but most will do no such thing. Kingston explained (in litt., 1985): "Some birds will no doubt have reached the permanent islands and have some chance of survival, but one cannot help feeling that the larger predators of the area are the most likely to have done so and will rapidly decimate the prey species, each other and finally die of starvation."

Had the individuals who planned Tucuruí Dam been made aware of the Minimal Critical Size project being conducted deep in the Brazilian Amazon north of Manaus, they may have realised the minimal value of these islands. For there to be a complete biota intact, an area needs to be 250,000 hectares in extent - as the size decreases, so too does the number of birds, mammals, etc. present.

Birds displaced outside the flooded area may not fare any better. The Amazon has been described by many as containing endless riches, with the trees teeming with primates and birds and a forest so thick as to be impenetrable. This is mere fiction: when one travels to the area, the first thing that is evident is the fragility of the soil and the absence of wildlife, which can be seen only if one has extensive experience in the field. Here the equilibrium can be upset very easily and this is the expected outcome when birds from a disturbed area move into a pristine one. Chances are that the sector contains the appropriate numbers of birds it could support, both in terms of food and nesting size. Increase this number, and disarray will prevail.

The Golden Conure typically occupies *terra firme* forest, recognised by the fact that it never floods and is on high ground. The only record of Ararajuba occurring in *várzea* or flooded forest dates back some years to a location near Tucuruí. The parrots avoid deforested or cleared areas except when nesting; they then venture into the open, selecting a living or dead tree in which to nest. One or more pairs will use the same site; up to seven chicks can be found simultaneously, these the production of at least two but possibly three hens (infertile eggs are also usually present). Each group, which includes the breeding pairs and possibly their young from the previous year, will rear the young together. If the nestlings are removed, it is customary for replacement clutches to be produced.

Once the chicks fledge, the birds return to continuous forest. Only in minimally disturbed areas will they remain near the nest the entire year, and then it is used for sleeping.

This peculiar nesting habit, known for many years by inhabitants of the area it occupies or trappers who collect young, was only recently discovered

by ornithologists. It may extend the chances of the species' survival, but only slightly because it must have mature forest into which it can retreat.

Apart from the very serious threat of habitat destruction, this species also suffers from persecution for food and for the clandestine bird trade. Although it has been many years since the Golden Conure has been exported legally from Brazil, it has not stopped flowing out; all end up in Europe or, less frequently, Asia. Some are sold in southern Brazil. It is difficult to say precisely how many young are removed from the nest or adults trapped, but it would be conservative to say that it numbers a hundred.

One reason why it is so popular is its beauty and intelligence. W. T. Greene, who in the late 1800s produced a three-volume series titled *Parrots in Captivity* stated that among parrots there is "perhaps no more striking looking creature" than the Golden Conure. Its beauty is, in my eyes, highlighted by its size: it is the largest *Aratinga* conure. But amongst parrots it is perhaps the most intelligent and this fact has been pointed out by virtually every avicultural writer. Tame birds will allow handling without complaining; they appear to thrive by giving their owners affection, by sitting against one's chest for long periods while being petted, by quietly sitting on the hand looking at one, or by gently nibbling on the finger and then looking at the face for a reaction.

If widely available, these gems would be in great demand for pets. Few parrots could equal Ararajuba in this respect, but then given the small gene pool in captivity and its endangered status, all young must enter breeding collections. In doing so, its future is secured.

If the Golden Conure has two faults, it is its habit of feather plucking or mutilating and its voice: a piercing shriek that could easily stand every hair on one's head! However the Moluccan Cockatoo *Cacatua moluccensis*, Hyacinthine Macaw *Anodorhynchus hyacinthinus*, and Double Yellow-headed Amazon *Amazona ochrocephala oratrix* are all equally endowed with strong voices and this has not reduced their popularity. The voice comes with these birds, and if one is interested in keeping or breeding them, this must be accepted. Plucking is another story.

Feather plucking is almost synonymous with the Golden Conure, with the vast majority of individuals falling victim to this vice. Over the years, I have noticed that this problem is as common in young as it is in adults; the former, being highly inquisitive, often chew at the flight and tail feathers of their siblings to occupy their time. It also seems that feathers are despoiled more commonly in spring and summer, and less so during and after the moult.

No one has been able to define the causes that induce plucking, but two factors appear to play roles: boredom and a deficiency, perhaps of animal protein or some mineral. Those individuals which are most familiar with Ararajuba in the field have never observed specimens with obvious feather problems (e.g., bare areas or badly chewed flight or tail feathers, the most easy

to observe under field conditions, though in all fairness, one must point out that any bird with major plumage faults would probably become easy prey). This is due to the constant activity: the birds never feel bored due to the countless leaves and branches that are available to chew, naturally occurring holes that can be inspected, and presence of others of their kind for mutual preening and playing.

Golden Conures, as has been previously stated, are highly family or group oriented. Most aviculturists lack the means of being able to keep more than one pair, hence the birds forego the benefits of being held in groups. One successful Latin breeder has kept and bred his in a small colony, and to my knowledge, there has never been any serious feather problems.

Keeping a pair or even a singleton invariably occupied appears very important. These intelligent birds enjoy playing with toys, swings, bells, and the like, more than most parrots; these should be offered continuously, but they should be changed regularly or the birds suffer from monotony. In cases where these are available and plucking still occurs, then the diet should be analysed. A friend who kept his pair at liberty in the house and provided them with countless things with which to stay amused had one bird denude itself in every area it could reach. It then started on its mate, removing first the flight and tail feathers. When the problem was reported to me, I suggested increasing the amount of fruits and vegetables, reducing oily seeds and offering fish or cooked meat or poultry several times weekly. These seeds, incidentally, were found by Ron Hastings to cause feather plucking in cockatoos. Once they were replaced with greens, fruits, vegetables and sprouted seeds, the problem ceased altogether. The aforementioned pair of Golden Conures soon ceased plucking and feathered out. They have yet to despoil another feather.

I have seen many parrots in their habitat, and have several times recorded them eating animal protein. My feeling is that the Golden Conures would probably take insects, snails or lizards in their natural conditions. If these were provided, along with a mineral lick containing salt and various trace elements, any deficiencies might be overcome. Some years ago salt was considered taboo, but field work is showing that parrots from macaws to cockatiels, actively seek this in the wild. Providing it in limited quantities is, therefore, natural.

Birds afflicted with feather plucking may be undesirable as pets, but they need not be wasted - these can make perfect breeders; and captive breeding can only help to keep the Golden Conure extant. The first to breed this avian gem was Dr. W. C. Osman Hill of Sri Lanka (formerly Ceylon). A pair obtained in 1936 nested at the end of 1938, and fledged two young in May 1939. Also that year, G. T. Turner produced young in Britain - the first success for that country. Several other English aviculturists have since bred this species, but none has achieved the success of Jim and Pearl Hayward of

Oxfordshire. The foundation stock was in single figures but twelve years later, their goal of 50 was established, including third generation young; and the fabulous number of 24 was bred in 1983.

In the US, Mrs Oliver Gilmer was the forerunner of a number of breeders, the most successful of which has been Busch Gardens in Tampa. Under the direction of Ed Bish, the species has bred there regularly for many years. When Richard Naegeli was Curator of Birds there in the late 1960s, the Golden Conure was bred on the colony system (Dave West, *in litt.*). Colony breeding has been used with great success by P. J. E. Béraut of Brazil.

Many Golden Conure hens willingly lay in captivity and prove as prolific as Sun Conures *Aratinga s. solstitialis*. As an example, a hen belonging to the West German aviculturist and author Thomas Arndt produced 100 eggs in an eight year period. Unfortunately, these were infertile due to the absence of a mate. In 1982, he finally reared young.

My own experience at breeding this species is limited to a three-year old, captive-bred pair obtained last year. They were placed in a cage approximately 1.2 m. (4 ft) long, with an attached nest 25 cm (10 in) square and 60 cm (24 in) deep, lined with several pieces of soft, rotted wood. The initially tame birds started showing aggression in the middle of last year: they would erect feathers, move from side to side and suddenly lunge forward, sometimes charging at my hand. During mating, which became a regular occurrence, the female would crouch. The male placed a foot on her back, then tails crossed. During this act, the wings were quivered and accompanied by ineffable sounds. Afterwards they both called loudly to the world.

Towards late August, the hen started spending time in the nest. By then she (sometimes in the company of the male) had chewed the available wood. The first of four eggs appeared on September 18th, each of the next two every second day with the last four days after the third. Approximately 28 days later - exact information is unavailable as I was out of town for two weeks during this time - the first of four young hatched. These were covered in white down and were capable of producing a long squeak after about 24 hours. The down soon abraded and the chicks remained naked until the first feathers appeared - a character not found in other *Aratingas*, which get a secondary down, usually dark in colour. Slightly over the third week, pin feathers appeared and the chicks were completely feathered by the time they left the nest, at about ten weeks. The last to hatch fledged at 12 weeks, presumably because the parents paid less attention to it when newly hatched.

Pairs of conures usually prove perfect parents for about three weeks, when they often lose interest in their young or become abusive. I have seen them bite the young and know of cases where they have killed or maimed them. This pair of Golden Conures proved ideal parents, tending to the young like few other parrots: they invariably kept their progeny full of food - except for

the first few days in the life of the last, when they paid only slight attention to it, feeding it after the first three had their fill. Their attention was so that it was decided to allow them to fledge their progeny, rather than pull them as is customary.

On emerging from the nest, all had soft, pink bulbous swellings to the base of the upper mandible. Their plumage differed from each other; each had largely yellow plumage with green streaking to the head and mantle, cheeks and mantle, or just mantle. All had green quills to the tail feathers. Their plumage was flawless, then one day the parents chewed the tip of the flight and tail feathers. That day, when the eldest was just over 15 weeks old, all were removed, fearing that they would be denuded by their ever attentive parents.

Removing the chicks, as is often the case with conures, stimulated them into nesting anew. The first egg was laid precisely nine weeks after the chicks were removed. The entire clutch numbered three (all removed for artificial incubation), but this did not thwart her interest in bringing forth more young for she laid another set; two hatched and one is being reared at the time of writing.

The beauty of the nestling *guarouba*, along with all the aforementioned extolled qualities, make them irresistible; even I could not keep away from their enclosure. But this will have to be resisted, for come three years' time, these young must breed - and it is acts like this on the part of breeders of this species that will keep Ararajuba extant, so that future generations will be able to read reports such as Ruschi's and know that a special jewel has not been lost forever.

* * *

BREEDING THE ROYAL STARLING

By DONALD RISDON

(Rode Tropical Bird Gardens, Somerset)

These elegant and graceful birds are among my favourites. I first came to know them back in the 1930s when they were quite frequently imported. When the war came there was no further supply and after the war the chances of seeing them again seemed pretty remote. A few years ago we were offered some Royal Starlings. I hastened down to the dealer's premises and bought four. These were wintered in a greenhouse aviary with a little artificial heat with the idea of being able to put them in an outdoor aviary when the weather improved. Due to negligence on my part one of them got out and was never seen again. The remaining three birds spent several years with us. It became obvious after a while that we had a cock and hen and a bird of unknown sex. This particular bird eventually succumbed and we were left with a true pair.

Like most glossy starlings they are difficult to sex but if you look closely at our pair the male has a heavier and slightly curved beak. The female had a thin straight beak which reminded me more of a wagtail; apart from this slight difference there is no distinction between the sexes in the pattern or colour of the plumage.

This year (1989) we have bred them for the first time at Rode. The first summer they were kept in an outdoor aviary, with shelter attached, occupied by various small finches and waxbills which they did not molest in any way. There was in that year no attempt at nesting. The following summer they were again put outdoors and did make an attempt to build a nest in the box provided, however nothing came of it. This happened during a hot spell and when the weather turned cold, as it so often does in this country even in mid-summer, nesting operations ceased abruptly and that was that for the season (1988).

This year, 1989, the long, hot, dry summer seemed to stimulate the birds to do better than they had before. Within days of being put outdoors from their winter quarters they started carrying nesting material consisting of moss and pieces of hay and similar material into their nest box. After a week or two they had laid three eggs from which three chicks hatched, one chick died early in the nest leaving two which eventually fledged. One chick did not look as strong as its nestmate and eventually died. We finished up with one chick reared to maturity and the old cock bird. The old hen died soon after having reared the chicks.

Now a few words about their care and maintenance. They are always wintered indoors in an unheated bird room and are put outside during a warm spell in April or May. When I kept them in pre-war days I found they would

survive our winters quite easily without artificial heat but that was in Middlesex. I think the climate was warmer there than we have down in north-east Somerset. These birds are obviously happiest in warm, dry spells such as the summer we have experienced. Another thing that we have noticed is that they keep in much better condition on modern softbill diets than they did in pre-war days where one had to make up the mixture - a concoction which had to be moistened with water or milk. My memory of those pre-war starlings was that they always dropped their wings and never seemed to be healthy. The birds we are writing about now keep in excellent fettle and keep their wings tight to the body which is a sign of good health. On one occasion, which I have written about in our Magazine, I noticed these birds having a dust bath in the peat which covered the floor of their enclosure. This was during the winter when they were inside and the time of day was just before it got dark. It was a very strange thing to see these birds dust bathing like sparrows, I have never seen it since. We do not think that they indulge in bathing like most Passerine birds but they did enjoy a summer shower when they would ruffle their feathers whilst sitting out in the open flight.

The size of the aviary in which these bred is 14 feet by 12 feet by about 8 feet high (4.27 x 3.66 x 2.44m) with a wooden shelter attached. They use this shelter quite a lot even at night and are very easily driven inside when one wants to catch them. The aviary itself is planted and of course attracts a certain amount of insect life. Our pair have never shown much interest in mealworms but they do very much like the pupae, in fact they reared their young almost entirely on these insects. We have also noticed they have a strong partiality for ants and when these swarm in warm, still days during the summer they will fly down and peck them up as fast as they can. They eat practically no fruit except elderberries of which they are very fond; the trouble is that these are only in season for a very short time so the rest of the year they do not eat fruit; we have tried them with everything we know without success. To their softbill mixture we add hard-boiled egg on one day and grated cheese on the other, both of which ingredients are eaten freely.

The plumage of the chicks when they first leave the nest is very like that of the parents although it is slightly duller and their tails are not so long. They also have dark eyes which turn white as the birds get older. We also noticed that when the chicks first fledged their beaks were much paler than those of the adult with a pinkish shade but these pale areas quickly darkened until the beak was black as in the parents. Great credit is due to the keepers who, during the period when they were rearing young, assiduously fed them mealworm pupae every two hours or so from dawn until dusk; but for this attention it is doubtful if they would have reared any chicks. Like most softbills if you give them live insects they will feed the chicks once and then stuff themselves with what remains so that by the next feeding time there are no more live insects

for the young so they have to be rationed hourly throughout the day.

Incubation times and rearing times are given at the end of this article. The nest was not a very elaborate affair being merely a collection of things like moss and dead grass which formed a cup at the bottom of the nest box; this by the way was a parakeet box approximately 8 inches by 4 inches by 20 inches deep (20.4 x 20.4 x 50.8cm) with the usual entrance hole in the side near the top.

This breeding pair of birds occupied the aviary by themselves throughout the rearing period. At the beginning when they were first put out there were some Golden-breasted Buntings in the same aviary but these were removed obviously because they would have scooped a lot of the live food put in for the rearing of the young starlings.

Here are the statistics: Incubation time – 14 days; Rearing time (hatching to fledging) – 20 days for first bird, 22 days for second bird.

* * *

THE TRACY AVIARY SALT LAKE CITY, UTAH

By JOSEF H. LINDHOLM III
(Berkeley, California)

In marked contrast to Britain, where 18 collections, open to the public and largely devoted to birds are listed in the 1986 *International Zoo Yearbook* (Olney 1987), such institutions are presently rare in the United States. These include two private commercial establishments, the Miami Parrot Jungle (which recently changed hands) and Honolulu's Paradise Park, both emphasizing Psittaciform birds. (The famed bird collection at the Tampa Busch Gardens is still very much in existence, but shares the spotlight with a major mammal collection, while the Busch Gardens at Houston and Van Nuys, near Los Angeles, ceased operations in the 1970s.) Two private, nonprofit collections, created for the express purpose of research and propagation are nominally open to the public; the International Crane Foundation, in Baraboo, Wisconsin, and the Peregrine Fund's World Center for Birds of Prey, near Boise, Idaho. There are a number of "Nature Centers" and "Junior Museums" around the country, whose collections predominate towards birds, but, being small, locally oriented, and often composed largely of rehabilitated specimens, scarcely qualify as "Bird Parks". Finally, there are two municipal aviaries, run as departments of their respective City Governments; The Tracy Aviary, in Salt Lake City, and the Pittsburgh Conservatory Aviary, at Pittsburgh, Pennsylvania.

The Pittsburgh Conservatory Aviary, opened in 1953 (Hawkins, 1954), quickly gained international attention (Jones, 1968, Kirchshofer, 1968), with a distinguished breeding record, only to go through a difficult period in the 1970s. In the last ten years, under its Australian-born Director, Dr. Lindsay Clack, the Aviary has again attained world-class status.

The Tracy Aviary's 16.5 acres in Liberty Park, not very far from Downtown and the famous Temple Square (or, as I discovered, the airport), were for twenty years the site of Salt Lake City's Zoo, founded in 1912. In 1932 (Kirchshofer, 1968), the Zoo was relocated to a hillside high above the city, across the road from the revered spot where Brigham Young declared his Mormon followers' wanderings at an end. Named in honour of the donor of the land, the Hogle Zoological Gardens, perhaps still most famous for "Shasta", a Lion X Tiger hybrid, now long deceased, has undergone much recent improvement, is now a mainstream zoo, with many interesting mammals and reptiles, and a comparatively small bird collection.

Naturally, there was some displeasure over this move, and, apparently, some animals continued to be maintained, after a fashion, at Liberty Park.

Among the concerned parties were Mr. and Mrs. Russel L. Tracy, private aviculturists, whose social prominence may be gathered from a contemporary account (Anon. 1936) of a garden party;

“Coming from near and far, nearly 8,000 persons swarmed over the spacious lawns of the Russel L. Tracy home. . . on Saturday and Sunday, at the first annual open house of ‘Friendship Wall’.

“Two beautiful late summer afternoons lured the young and the old to the Tracy home to see the ‘Friendship Wall’, constructed of 400 stones contributed by persons held in high esteem by Russel L. and Kate Tracy.

“Then there were the 150 ‘residents’ of the spacious aviary ‘at home’ in their finest feathers. The many imported birds from the tiny African wax bill finch, hardly larger than a good-sized thumb, to the giant South American golden pheasant with its gold and black striped head, were received with shouts from the children and admiring sighs by the adults.

“The Tracys planned the open house so that the general public might enjoy the unusual sight before fall sets in and the birds and fowl are transferred to their winter quarters.

“. . . Hundreds of personal friends of the Tracys extended their congratulations on the open house, with state, county and city officials also attending.”

In 1939, the Tracys donated their collection to the City, to establish a public aviary at Liberty Park. A now somewhat weather beaten sign still stands;

“TRACY AVIARY - These birds, animals and children’s pets, presented by Mr. & Mrs. Russel L. Tracy to the boys & girls of Salt Lake.”

The “animals” in question were primarily common hoofed-stock and monkeys, though for some years the Aviary was a major source of Red Kangaroos. Mammals were finally phased out in the last five years.

While engaged in the reintroduction of Trumpeter Swans (Delacour, 1944, Dolton, 1988), Jean Delacour (1947) made the following description of the Aviary;

“I recently visited the Tracy aviaries at Salt Lake City. Under the excellent care of Mr. Calvin Wilson and his assistant, a very good collection of birds is maintained, the Parrots and Waterfowl being particularly interesting. Many exotic species are represented among the latter, but the local ones are the more remarkable. There are great numbers of birds on the ponds, the majority of which are specimens that have been gathered on the nearby Utah State Refuge, where they were found ill with botulism. . . By careful treatment in fresh clean water 70 per cent of the birds are saved, which otherwise would have perished. Other Ducks are reared from eggs gathered around the ponds. Mr. Wilson is particularly successful with the charming little Ruddy Ducks; he has dozens of them and they lay freely. Eggs are hatched in an incubator and reared in a brooder. They are given access to open water immediately and are fed very simply on Spratt’s duck meal, and lettuce. Mr. Wilson tells me that the secret

of his success consists of putting a yearling female with the ducklings. Once he was short of Ruddy females and he successfully substituted a female Lesser Scaup, and it worked perfectly well. . .

“Mr. Wilson rears by hand every year such difficult birds as Avocets, Stilts, Willets, various Gulls and Plovers, and this gives an idea of his patience and skill. He finds that the most difficult chick he ever reared was that of the Phalarope, which nests by the surrounding lakes. . .”

Calvin D. Wilson was Director of the Tracy Aviary from its inception in 1939 to his compulsory retirement, at the age of 75, in 1975. A life member of the Avicultural Society (Prestwich, 1970), he died in 1983. He arrived in Salt Lake City from the California Zoological Gardens (or “Selig Zoo”) in Los Angeles (Marvin Jones, pers. com.), the now-long-defunct, famed commercial repository for Hollywood animals, distinguished for an important breeding pair of White-naped Cranes (Mobley, 1933).

Marvin Jones, Registrar at the San Diego Zoo, and a long-time zoo historian, kindly provided me with the unpublished notes of his 1969 visit with Calvin Wilson at the Aviary. Typically, Mr. Jones took special note of significant age records*, two 40 year-old Galahs *Eolophus roseicapillus*, a 46 year-old Greater Sulphur-crested Cockatoo *Cacatua g. galerita*, a 12 year-old Peruvian Ruddy Duck *Oxyuraj amaicensis ferruginea*, a 16 year-old Puna Teal *Anas versicolor puna*, and a 30 year-old Cereopsis Goose *Cereopsis n. novae-hollandiae*, all alive in 1969, as well as birds (presumed) no longer present; a 46 year-old Bare-eyed Cockatoo *C. s. sanguinea*, a 19 year-old Shoveller *Anas clypeata*, a 22 year-old Whistling Swan *Cygnus c. columbianus*, and a Double-wattled Cassowary *Casuarus casuarus*, 32 years old. Some notable birds present in 1969 which were not there by 1980 were a Southern Spur-winged Goose *Plectropterus gambensis niger*, two Chilean Pintails *Anas georgica spinicauda*, four Australian Radjah Shelducks *Tadorna radjah rufitergum*, an “Orange-necked” Single-wattled Cassowary *Casuarus unappendiculatus* ssp., from Dillon Ripley, a Palm-nut Vulture *Gypohierax angolensis*, both a Grey-winged and White-winged Trumpeter *Psophia crepitans* & *P. leucoptera*, and at least 40 Bourke’s Parakeets *Neophema bourkii*.

Calvin Wilson’s distinguished aviculture, which also included, among other things, the production of a number of hybrid Hyacinth X Blue-and-Gold Macaws (Delacour, 1966), and the breeding of Trumpeter Swans (Prestwich, 1969), was conducted with only modest municipal funding. While the Aviary was endowed with a series of spring-fed canals and ponds, the cages were largely simple chainlink or wire and woodframe constructions. The first really elaborate exhibit complex, a series of planted aviaries surrounding a circular

*Based entirely on Mr. Wilson’s recollections.

building, was dedicated as the "Calvin Wilson Bird Pavilion" in 1970. Constructed for \$150,000, it was the last major exhibit to be built for more than a decade.

At my first visits to the Aviary, in 1980 and '81, although there were a number of interesting species, especially waterfowl and gamebirds, there seemed, in the absence of Mr. Wilson, to be a general atmosphere of tiredness and lack of purpose, with little evidence of current collection policy or future planning.

It was therefore with much anticipation that I learned of the appointment of D. Grenville Roles as the Aviary's Director in 1984. Mr. Roles will be familiar to long-time readers of this journal as the author of a series of articles on the Jersey Wildlife Preservation Trust's first British breedings of eight species of birds (Roles 1970, 1971 a, b & c, 1973 a & b, and 1975 a & b). He is also both author and illustrator of *Rare Pheasants of the World - A study of birds in captivity* (Roles, 1976), reviewed in this magazine by Risdon (1977). Mr. Roles left his position as Deputy Curator of Birds at Jersey, in 1975, for the Pencynor Wildlife Park in South Wales, then was manager of a private collection in California for a number of years before coming to Salt Lake City.

The collection stood at roughly 150 species and subspecies of birds at the time of Grenville's arrival. By 1st January 1986, the number had risen to 191, an all-time high, I believe, in the Aviary's history. (There were about 130 taxa in 1966 (Kirchshofer, 1968), and 1936 at the end of 1970 (Lucas & Duplaix-Hall, 1972).) On 1st January 1989, 220 taxa were counted, one of the largest bird collections in the Western Hemisphere.

Bird purchases are endowed by the locally administered Tracy Fund to which all proceeds from sales of Aviary birds return – a happy contrast to many American municipal zoos, where the animal sales profits go into a civic "general fund", from which the zoo may be allotted a portion. An Aviary Advisory Board exercises a degree of control over bird purchases.

Within a year of his arrival, Grenville Roles created a second administrative position, of Education Coordinator, to create an education programme. Mark Stackhouse arrived from Ohio's Dayton Museum of Natural History to fill this position. His programmes involved 4,500 persons in 1985, 10,400 in 1986, and 41,000 in 1987 (of whom 24,000 were visited in school classrooms, 7,000 attended the Aviary's amphitheatre programme, and the rest participated in summer classes, field-trips, an annual "Nature Fair", and other activities). He also established the Friends of Tracy Aviary, a zoological society which provides considerable local support, as well as an annual "adoption program", where donors cover a bird's care for a year. Prices range from \$10.00 for a Peafowl to \$75.00 for eagles and Peregrine Falcons. Mr. Stackhouse's staff of four part-time employees are also responsible for the care of most of the local "rehab" birds brought to the collection, many of which are released.

Mr. Roles directly supervises two full-time and two part-time staff-members, responsible for the rest of the bird collection. With the Aviary's office secretary, there are thus only five full-time employees. Mr. Stackhouse discovered, in an American Association of Zoological Parks and Aquariums Directory of U.S. and Canadian collections, that only two member institutions had smaller permanent staffs; a commercial "reptile-park", and a very small zoo in Kansas. Mark found the average staff-size for an institution with 500 to 800 specimens was 65. On January 1, 1989, the Aviary held 869 specimens.

In spite of this relatively minuscule staff, I found everything in an impressive state of affairs when I visited Tracy Aviary in October 1988, for the first time in seven years. Although most of the old cages were still in use, landscaping was much improved, with attractive concrete walkways replacing many shabby old asphalt walks. The entrance has been relocated, and is now a new bridge crossing a waterfowl-filled canal.

Grenville Roles was away on the day of my visit, but I was given a cordial tour by Mark Stackhouse. (I am also most grateful to Angela Balcar, then the Aviary's Secretary, now elsewhere, for transportation from and to the airport, enabling me to make the most of an unexpected "stopover" in Salt Lake City, due to altered plane schedules).

Considering that the author of *Rare Pheasants of the World* is in charge, one would expect to find the thirteen well planted compartments of the 1984 pheasantry, the first major construction since 1970, well-stocked. Such was the case, with two pairs each of Edwards' and Elliot's Pheasants (both under-represented in American public collections), and Temminck's Tragopans, as well as pairs of Cabot's and Satyr Tragopans, Cheer Pheasants (the male on loan from Denver Zoo, where I first saw it in 1978), and Swinhoe's Pheasants, a male Tibetan White Eared Pheasant *Crossoptilon crossoptilon drouynii*, and a pair of Chinese Bamboo Partridges *Bambusicola thoracica*. A surprising feature of this complex was an intelligently selected series of Asian birds which shared these cages; Spot-necked Doves *Streptopelia chinensis*, Great Barbets *Megalaima virens*, Collared Finch-billed Bulbuls *Spizixos semitorques*, White-crested, Lesser Necklaced and Red-tailed Laughing Thrushes *Garrulax leucolophus*, *G. monileger*, & *G. milnei*, Redfaced Liocichlas *Liocichla phoenicea*, Pekin Robins, Silver-eared Mesias, Japanese Grosbeaks *Coccothraustes personatus*, a female Rothschild's Mynah, considered of particular genetic significance by the AAZPA's Species Survival Plan, to be therefore mated with care, and Red-billed Blue Magpies. All too often, pheasants are kept by themselves, or else little care is given to ecological context (pheasants with touracos, etc.). As far as I know, only San Diego has gone farther in exhibiting appropriate pheasant communities.

To my knowledge, only the San Diego and Denver Zoos currently otherwise exhibit Cabot's Tragopans in the U.S. The Tracy Aviary's pair was bred

in Canada. As of May 1989, Grenville told me, fertile eggs have only been produced through artificial insemination, and the resulting chicks were dead in the shell. As they have only been in the collection since 1986, better results should be forthcoming. In mid-November 1988, a pair of Mikado Pheasants, a pair of Brown-eared Pheasants, and additional pairs of Cheer Pheasants and Chinese Bamboo Partridges were purchased from the aviculturist Bill Kuhn. Another female Cheer Pheasant arrived several days later from the Idaho waterfowl breeder, Jerry Korn. As I am not aware of any other U.S. public institution working with this species, it is encouraging that Tracy Aviary is thus committed. I should here mention that Roy Bouck, one of Grenville's two full-time aviculturists, has for many years maintained a private pheasant collection, among which various Copper Pheasant subspecies and the bronze mutation of the Impeyan Monal stand out. Grenville told me that Roy possesses the largest Impeyan cock he has seen.

Elsewhere on the grounds, along with the more standard sorts of pheasants, a number of very rarely exhibited Galliform birds may be found. Sharing a spacious Belden-wire corn-crib* with three Amherst Pheasants and a pair of Thick-billed Parrots, were a pair of Red-legged Partridges *Alectoris rufa*, the first I'd seen. Six specimens were counted on 1st January, 1989. I missed the single Grey Partridge *Perdix perdix*, which I have never seen. In November, after my visit, a pair of Barbary Partridges *Alectoris barbara* arrived from Bill Kuhn.

The most startling of the Aviary's gamebirds was a beautiful pair of Blue Grouse *Dendragapus obscurus*, in the collection since 1987, and most likely the only captive specimens at present. Mark Stackhouse told me that, while the chicks did not present great difficulties in husbandry, adults have traditionally proved almost impossible to maintain. A major problem has been accommodating, in captivity, this species almost exclusive winter diet of Douglas Fir *Pseudotsuga menziesii* needles. Mark informed me that every week in winter, Aviary employees collect chopped-down Douglas Fir saplings, which supplement Gamebird pellets. Without elaborating further, Mark said this high-tannin diet produces "really remarkable droppings". This pair is at present the Aviary's only Grouse, but an exhibit for a complete series of North American Grouse and Quail is anticipated.

The Blue Grouse share a very large, beautifully planted, ramshackle, chicken-wired, wood-framed cage with a pair of American Kestrel *Falco sparverius* that produced six fertile eggs in 1988. Two young were successfully reared in this exhibit that year.

*Prefabricated corn-cribs of various dimensions have, for a number of years, been very widely adapted as bird and mammal cages in zoos across the U.S.

A large, arched, chain-link cage, planted with tall Poplar-like trees, is the site of the first public collection breeding of the Cooper's Hawk *Accipiter cooperii*. Although it is an abundant bird in the Western states, and notorious for harassing aviary inhabitants, like other members of its genus, it is very rarely exhibited, although, Mark Stackhouse informed me, roughly 50 have been bred privately. Although Mark told me a wild pair nests on the Aviary grounds, I still found it remarkable that breedings take place in this very public exhibit. The adult pair were exhibited, at my visit, with the male and female hatched in 1987. As it had been found that the parents ate their chicks at six days, these two had been hand-raised and later reintroduced. It is eventually intended to release them. In 1988, four chicks were hatched, but none survived.

The Tracy Aviary owns two of the nine Andean Condors produced by the famous breeding pair at the San Diego Zoo between 1942 and 1952 (Lint, 1959 & 1961). Marvin Jones informed me that these birds, both males, were the second hatching, of 8th June 1945, and eighth of 23rd May 1951, the first of its species to be incubator-hatched and hand-reared. Both were, in fact, sent first to Salt Lake City's Hogle Zoo. The date of this transaction, and that of their transfer to the Aviary, are not now available. Presently, one of these birds (which, I am not certain), "a confirmed wife-killer", as Mark Stackhouse informed me, is on exhibit loan to a small zoo in Utah. Though the remaining male "courts massively", Mark tells me the Aviary's female "never looks interested", and is thus slated for replacement.

Other bird-of-prey exhibits include an open meadow for nonreleasable pairs of Bald and Golden Eagles, the latter frequently engaged in mating activities, and recently renovated aviaries for pairs of Swainson's Hawks *Buteo swainsoni*, Turkey Vultures *Cathartes aura*, and Snowy Owls. I especially liked the Swainson's Hawk's cage, decorated with clever artificial Cliff Swallow nests.

A number of non-releasable birds-of-prey are included in the collection of the Education Department and appear in the very popular amphitheatre demonstrations, or travel to schools. Along with the commoner local species are American Peregrine Falcons *Falco peregrinus anatum* and a Northern Pygmy Owl *Glaucidium gnoma* in the collection since 1986. Other interesting Education Department birds include an imprinted Flicker *Colaptes auratus* and a Western Meadowlark *Sturnella neglecta*, also hand-reared, which learned its song from House Finches *Carpodacus mexicanus* in Mark Stackhouse's backyard, and maintains great composure when released from its cage in the midst of a circle of mealworm-proffering children.

Of the Education Program birds, I found the most singular to be two Common Nighthawks *Chordeiles minor*, one acquired as a broken-winged adult in 1986, the other brought in as a fledgling in 1987. Both are wonderful-

ly tame and handlable, appearing at schools and the amphitheatre, readily demonstrating their enormous gapes. One that Mark Stackhouse brought out and set on a lawn for me to examine made no attempt to escape, eagerly investigating the edible potential of my fingers. Grenville Roles told me they receive dogfood and a commercial bird-of-prey diet, rolled into little balls, supplemented with crickets and mealworms, all hand-fed.

Their sex, when I visited, was unknown. They are maintained together in a spacious indoor, off-exhibit cage shared with one Broad-tailed and four Black-chinned Hummingbirds *Selasphorus platycercus* & *Archilochus alexandri*, received as nestlings, and two hand-reared Barn Swallows *Hirundo rustica erythrogaster*. It will be interesting to see if these two Nighthawks eventually exceed the eight years and two months captive-longevity record of a bird that died at the Assiniboine Park Zoo, at Winnipeg, Manitoba, on 29th September 1984 (Lindholm, 1989).

Mark Stackhouse told me the Aviary has released other Nighthawks, as well as another Caprimulgid, the Poorwill *Phalaenoptilus nuttallii*. Among other birds brought there for rehabilitation in 1988, were five Bohemian Waxwings *Bombycilla garrulus pallidiceps*, in a small temporary cage, all in beautiful condition, continuously twittering. They will be retained for permanent exhibit. Fifteen local Hummingbirds were received in 1988, including two Calliopes *Stellula calliope*, the smallest U.S. species, that were successfully released. At present, Tracy Aviary does not have exhibit facilities for Hummingbirds, but one for both local and exotic species is anticipated shortly.

The tradition, noted by Delacour (1947), of collecting young local shorebirds, continues at Tracy Aviary. Two young Black-necked Stilts *Himantopus mexicanus*, and three American Avocets *Recurvirostra americana* were thus obtained on 20th June 1988, joining, respectively, one and five birds already in the collection. Collected on the same field-trip were six Cinnamon Teal ducklings *Anas cyanoptera septentrionalium**, joining four specimens, and six Yellow-headed Blackbirds *Xanthocephalus xanthocephalus*, making up a unique captive group of four males and five females of North America's largest Icterid "Blackbird". All four of these native species are exhibited in the largest of the old cages, a great domed aviary with an extensive pool, also occupied by Blue-winged Teal *A. discors*, of which a number were purchased in 1988, Laysan Teal *A. platyrhynchos laysanensis*, Ringed Teal *Callonetta leucophrys*, a Long-billed Curlew *Numenius americanus*, hopefully to be joined by a bird at the Hogle Zoo, a pair of the black-headed Franklin's Gull *Larus pipixcan*, and a prolific colony of Western Mourning Doves *Zenaida macroura marginella*.

*More than half of the individuals of this, the North American subspecies, breed in Utah (Todd 1979).

Most of Tracy Aviary's 48 species and subspecies of ducks, geese and swans, are maintained in open enclosures along spring-fed canals, or in a connected small lake, which the new entrance bridge crosses. Seventeen taxa of waterfowl hatched in 1988, among them being one American Goldeneye *Bucephala clangula americana*, two Northern Ruddy Ducks *Oxyura j. jamaicensis*, five Hooded Mergansers *Mergus cucullatus*, four Cinnamon Teal, eight Great Basin Canada Geese *Branta canadensis moffitti*, three Pacific White-fronted Geese *Anser albifrons frontalis*, and three Black-necked Swans. Other interesting species listed on 1st January 1989 included two Greater Snow Geese *Anser caerulescens atlanticus*, two Ross's and four Emperor Geese, six Nénés or Hawaiian Geese, three Dusky Canada Geese *Branta canadensis occidentalis*, a very distinctive and rarely displayed subspecies, two Red-breasted Geese, a pair of Ruddy-headed Geese *Chloephaga rubidiceps*, four New Zealand Shelduck, two Marbled Teal, two female Common Eiders of undesignated subspecies, five Canvasbacks *Aythya valisineria*, twenty-two Redheads *A. americana*, also breeding in 1988, and two Ringnecked Ducks *A. collaris*. Six male and ten female Northern Ruddy Ducks were inventoried. A welcome recent addition are four Falcated Teal *Anas falcata*, which arrived November 29, 1988, with "Silver" and wild-type Lesser Bahama Pintails *A. b. bahamensis*, and a second pair of Emperor Geese from the Idaho breeder, Jerry Korn. Wild Wood Ducks and Mallards are constant "visitors".

Twenty eight species and subspecies of parrots appear on the January 1989 inventory, currently an unusually large collection for an American public institution, with an emphasis on New World species. This is a change from the past, when the Aviary's selection of Parrots tended more towards Australian species. It appears the collection policy is now aimed more towards species not so popular with private aviculturists. Of the Broadtails, only the very rarely exhibited Port Lincoln Parrot *Barnardius z. zonarius* is now present, with a pair in their own aviary, and another male held off-exhibit inside the Wilson Pavilion. The pair, which hatched, but did not rear, three-chicks in 1988, are not kept far from one of the Aviary's three pairs of Northern Thick-billed Parrots *Rhynchopsitta p. pachyrhyncha*. Another pair are also kept by themselves, while the third pair share a corn-crib with the afore-mentioned Red-legged Partridges (which are breeding), and Amherst's Pheasants. I was surprised to hear that Thick-billed Parrots were first bred at Tracy Aviary in 1965, within days of the world first captive breeding record at the San Diego Zoo on 8th September. I am not aware of the exact date. Marvin Jones found three birds at the Aviary at his visit on 10th December, 1969. Of the six birds now in the collection, one each is on breeding loan from the private aviculturist Jim Singleton, the San Diego Zoo, and the Sacramento Zoo, in California, which has been especially successful with this species. Another arrived as a

gift from the San Diego Zoo in 1988. The Aviary's original breeding female, in captivity more than thirty years, is still there, its mate having died this past winter. Grenville Roles informed me that a female offspring of this pair was sent, in 1988, to Dr. Noel Snyder, for his Arizona re-introduction programme (Snyder & Wallace, 1987).

Other parrots, at various locations in the grounds, include a breeding pair of Alexandrine Parakeets *Psittacula eupatria*, with Silver Pheasants, a pair of Tibetan Parakeets *P. derbiana* in a corn-crib with a pair of Blue Eared Pheasants, a breeding colony of six Nanday Conures *Nandayus nenday* in the same aviary with eleven Quaker Parrots *Myiopsitta monachus*, also breeding, and a prolific colony of 13 Lesser Patagonian Conures *Cyanoliseus p. patagonus* in their own cage.

Tracy Aviary still holds one of the Hyacinth X Blue-and-Gold Macaw hybrids that so impressed Jean Delacour (1966), now part of the Education collection, and described as *Hybridus monstrosus*! Two pairs of Blue-and-Gold Macaws are now in the collection, as well as a pair of Hyacinths, the latter sharing, with two male Black Korhaans *Afrotis atra afraoides*, one of a series of aviaries constructed from open pens formerly for mammals and ground birds, arranged around a carriage-house-like structure. The other parrot species exhibited in this section is the Greater Vasa *Coracopsis vasa*, a bird that the Aviary, with the close cooperation of the Avicultural Society of Utah, is especially committed to propagate. Of the five specimens in the collection in May 1989, two had been on loan from the Society since 1986 (when the Aviary obtained another pair) while the fifth, a male, is a recent donation by the Society, procured expressly as a mate for the older female, the first of its species to lay eggs in captivity (three were laid in 1988). This hen's aggressiveness is likely the cause of thus far clear eggs. It is hoped a change of mates will produce better results. At my October 1988 visit, all the Greater Vasas were in winter holding in the Calvin Wilson Pavilion.

In the other former paddocks in this complex, at my visit, were five Vulturine Guinea fowl kept with a breeding pair of West African Crowned Cranes, Triangular Spotted Pigeons *Columba guinea* with a Grey Peacock Pheasant, Great Crowned Pigeons, Blacksmith Plovers, and a San Diego Wild Animal Park-bred Hammerkop that had killed its mate, a female European Wood Pigeon, perhaps the only one in the country, for which Grenville has yet to find a mate, kept with Victoria Crowned Pigeons, and pairs of Stanley Cranes and European White Storks, each in their own display.

Near these avairies are large yards for "Blue-necked" Ostriches of unspecified subspecies, and Emus kept with Demoiselle Cranes.

Perhaps the Aviary's rarest parrots are the two pairs of Bodin's Amazons *Amazona festiva bodini*, together at my visit, sharing with rarely seen Crested Bobwhite Quail *Colinus cristatus* one of the 14 aviaries that make up the

exhibits of the Calvin Wilson Pavilion. Mark Stackhouse told me that only eight others were in the U.S., imported, with the Aviary's birds, in 1987. I found these robust, red-browed birds especially attractive.

An adjoining aviary held a wonderful group of four Slenderbilled Conures *Enicognathus leptorhynchus*, all actively digging in the dirt floor of their exhibit, with only their dark-red tails visible. I counted seven holes. 1988 was an unusually productive year for this species, one pair successfully rearing six chicks, the other pair seven, both in February. All of these offspring, and the three hatched in 1987, were sold or exchanged to private parties in 1988. I am not aware of any other U.S. public display of these distinctive, temperate-climate parrots, which have been at Tracy Aviary since 1986.

Next to the Slenderbill's cage, a pair of Hawk-headed Parrots *Derophtus accipitrinus* shared their exhibit with three Neotropical Lapwings or Teru-Terus *Vanellus chilensis*. A pair of Redfronted Macaws *Ara rubrogenys* shared their display with a Zenaida Dove *Zenaida aurita*, hardly ever seen in public collections although it is present in American private aviculture, and Elegant Crested Tinamous *Eudromia elegans* conversely, by far the most commonly seen tinamou in zoos.

Two exhibits in this complex held pairs of Red-billed Toucans *Ramphastos tucanus*, a great rarity ten years ago, but now imported in some numbers from Surinam. One pair was kept with Razor-billed Curassows, the other was by itself but had shared its cage with Red-legged Seriemas. A pair of Toco Toucans were exhibited with pairs of Great Curassow, Ringed Teal, and recently acquired Silver Teal *Anas v. versicolor*, in a nicely sodded display. A trio of Piping Guans *Aburria pipile* were by themselves. Further pairs of Ringed and Silver Teal occupied an aviary planted with Japanese Maples, shared with two Mountain Witches or Crested Quail Doves *Geotrygon versicolor*, Red-crested Cardinals *Paroaria coronata*, a pair of White-faced Ibis *Plegadis chihi*, and two young Scarlet Ibis from Disney World's "Discovery Island", in Florida. It is intended that two "Discovery Island"-bred Scarlet Ibises will arrive each year until a dozen have been sent.

Two aviaries in the Wilson Pavilion held groups of small perching birds. I was especially pleased to see, in one, a true pair of Green Cardinals *Gubernatrix cristata*, a bird no longer exported, with a handful remaining in U.S. aviculture, yet, at the same time, possessing a potential for prolific reproduction. Another species that stood out in the same cage were seven of the well-known Red or Dwarf Turtle Dove *Streptopelia tranquebarica*, the first I had seen. Although it is not uncommon in private aviculture, it is, I think oddly, an extremely rare U.S. public exhibit at present. The Aviary reared two this year. Other birds in this aviary were a Crested Finch *Lophospingus pusillus*, an indistinctly-seen Black-and-White Seedeater *Sporophila luctuosa*, and several I did not see; a Ruddy Quail Dove *Geotrygon montana*, a male

Hooded Siskin *Carduelis magellanica*, in the collection at least four years, and a male Painted Bunting *Passerina ciris* of similar age.

I did see one of the two male Lazuli Buntings *Passerina amoena* which share an exhibit with a beautiful male Bullock's Oriole (the Western race of the Northern Oriole *Icterus galbula bullockii*), Saffron Finches *Sicalis flaveola*, and a pair of Palawan Peacock Pheasants.

At my 1980 and 1981 visits, I had been intrigued by Grey Peacock Pheasants labelled as *Polyplectron bicalcaratum ghigii*, the Vietnamese and Laotian subspecies, named by Delacour and Jabouille after their august Bolognese friend. A pair, sharing a Wilson Pavilion cage with a pair of Red-beaked Hornbills and North American Bobwhites, was still thus labelled in 1988. Grenville Roles, however, is not convinced that the Aviary's birds are identifiable as to their subspecies. At any rate, the other pair that I saw, in an afore-mentioned exhibit with Great Crowned Pigeons and a Hammerkop, were not subspecifically identified.

A final cage in the Wilson Complex held a pair of Blue-crowned Motmots, a pair of Sun Bitterns, and a further pair of Elegant Crested Tinamous.

Since my visit, one of the Wilson Pavilion aviaries has been converted to an exhibit for a pair of Bat Falcons *Falco rufigularis* that arrived on loan from the World Center for Birds of Prey, in Idaho, on November 3, 1988. The other American "zoo" specimen I am aware of is one that the New York Zoological Park exhibited in its World Of Darkness in the 1970's.

The interior of the Wilson Pavilion is to be eventually remodelled into a sky-lit South American walk-through aviary, but presently serves as a winter-storage facility, with birds being temporarily housed there for other reasons as well. Among the more interesting specimens at my visit were a recently mated Galah or Rose-breasted Cockatoo with the pinkest crest I have seen, Alexandrine Parakeets *Psittacula eupatria*, two recently obtained Dusky Parrots *Pionus fuscus*, a breeding pair of Pink-crested Touracos with some offspring in a separate cage, Port Lincoln Parrots, Derbyan Parakeets, Rufous Tree-pies *Dendrocitta vagabunda*, a female King Vulture, for which a male had yet to be found, the afore-mentioned Greater Vasa Parrots, and two Umbrella Cockatoos.

Along with the conversion of this facility into a South American exhibit, and the afore-mentioned anticipated North American Game-bird Pavilion and Hummingbird house, a number of new displays are planned for the next few years, including a new flamingo enclosure (I saw five Chileans), a tropical pheasantry and, particularly intriguing, twin exhibit complexes for birds of Utah and the Andes, presenting a series of altitudinal communities. The continued development of this revived, world-class collection promises to be most interesting.

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THE WHITE STORK: A CAPSULE OVERVIEW OF ITS STATUS IN THE WILD AND THE ROLE OF CAPTIVE REARED AND BRED BIRDS IN RE-INTRODUCTION

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In 1988 it was estimated that the total world population of the European White Stork did not exceed 490,000 and of these only 100,000 were 'western' birds, i.e. those over-wintering in West Africa (Goriup, 1988). These can be sub-divided into those breeding either in western and northern Europe (just 35,000 nesting storks) or in the Maghreb (north-west Africa). The remaining 'eastern' birds breed in eastern Europe and migrate via the Bosphorous to over-winter in east- and southern Africa (Fig. 1). This 1988 population figure represents a dramatic decrease over the last one hundred years, particularly in the north and west of the European range. Regular censuses carried out since 1934 show this all too clearly (Table 1). Since 1974 alone the number of White Storks breeding in western Europe has declined by 20% and the future looks even more bleak. The last regular breeding of the White Stork in Belgium was in 1895, in Switzerland, 1949 and in Sweden, 1954 and it has become effectively extinct as a breeding bird in Denmark, France and the Netherlands, virtually restricting the western population to the Iberian peninsula.

White Stork numbers are more stable on the eastern European breeding grounds (including Bulgaria, Czechoslovakia, Hungary, Poland and Yugoslavia), with recent increases and expansions being noted in the Soviet Republics of Estonia, Latvia and Russia. Why this dramatic decline of the western population and what action is required to rectify the situation?

The White Stork is a bird whose very livelihood is dependent upon, and intricately linked with man's activities and, of course, the environmental conditions in two continents. There are multiple pressures on the birds in both their breeding and wintering grounds and further hazards are encountered each spring and autumn on the long migration flights. Reductions in food resources (linked to drought and habitat destruction), hunting, collision with overhead power lines and pesticides have all been cited as having detrimental effects on the White Stork.

On the breeding grounds changes in agricultural practices have altered the habitats previously preferred by the White Stork and (as might have been expected) its numbers have declined most drastically where such changes have been greatest: in the Netherlands, the Upper Rhine valley, northern Germany and Denmark. Fertilizer and pesticide use has increased and the drainage of wetlands has resulted in the loss of feeding grounds on a massive scale. As

Table 1 Decline in the numbers of *wild* White Stork pairs since 1934 (from Cramp & Simmons, 1980; Goriup, 1988; & Vos, 1985).

	1934	1984
Switzerland	10	0
Sweden	12	0
The Netherlands	273	2
Denmark	859	<12
France	155	20 - 25 (1989)
West Germany	4391	635
East Germany	4628	2775
Spain	14513	6750
Portugal	5741 (1958)	1533

land drainage lowers the water table the supply of earthworms, an important food source for newly-hatched birds, is rapidly depleted. The high levels of persistent pesticides and industrial chemicals, particularly PCB's, in central and eastern Europe are likely to be having severe effects on White Stork reproduction and in the opinion of Schulz (1988) the levels of PCB's found in eggs in Germany and Holland *do* affect breeding and may be the single most important factor threatening the White Stork in Europe.

By comparison, in parts of eastern Europe, still existing wetlands are good breeding grounds and particularly in southern Poland, extensions of pasture land, clover and alfalfa cultures favour stork populations.

Why, however, do many apparently still suitable areas for White Storks in western Europe, some adjacent to 'inhabited' areas in eastern Europe, remain unoccupied? Scientists and conservationists have had to look to the migration routes and wintering grounds for the cause of the problem.

On migration, hunting is one of the most frequently quoted threats to the White Stork, although caution is needed here since hunting is more easily detected than death through either food shortage or habitat loss. Fewer than 1,000 White Storks now fly through the Pyrenees on migration (François Sagot, pers. comm. 1989) but once they were prime targets for the sportsmen who shot in the mountains each spring and autumn. Fortunately, this practice is becoming less and less common as more areas become protected by conservationists.

Hunting is still a problem in parts of North Africa and the Middle East. In Syria and Lebanon as many as 6,000 of the 'eastern' storks may be shot annually: good sport for well-to-do citizens and target practice for bored Lebanese soldiers. In Egypt the Nubians and Bedouins still hunt White Storks for food, using both firearms and primitive traps (Schulz, 1988; Goriup, pers. comm., 1989).

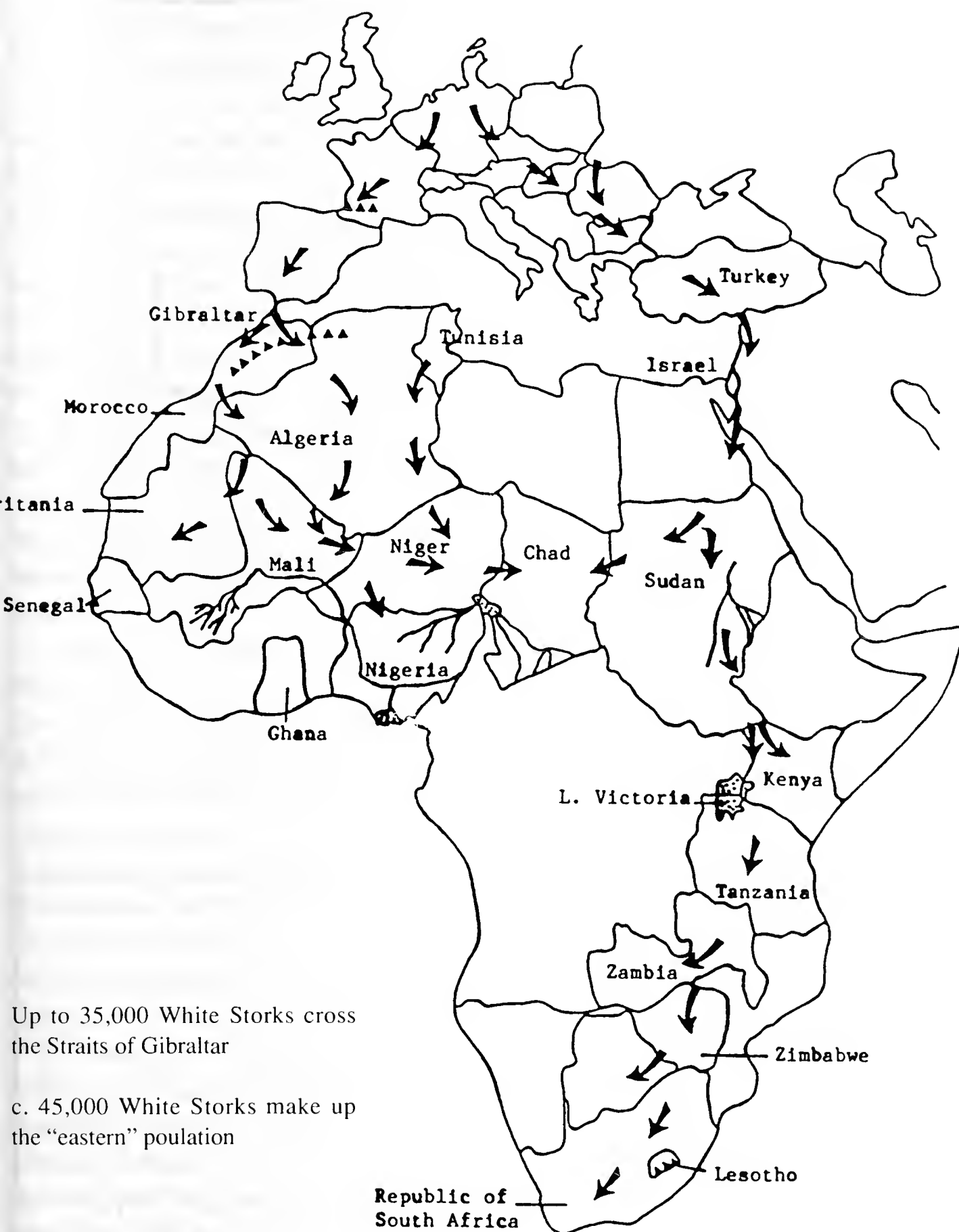
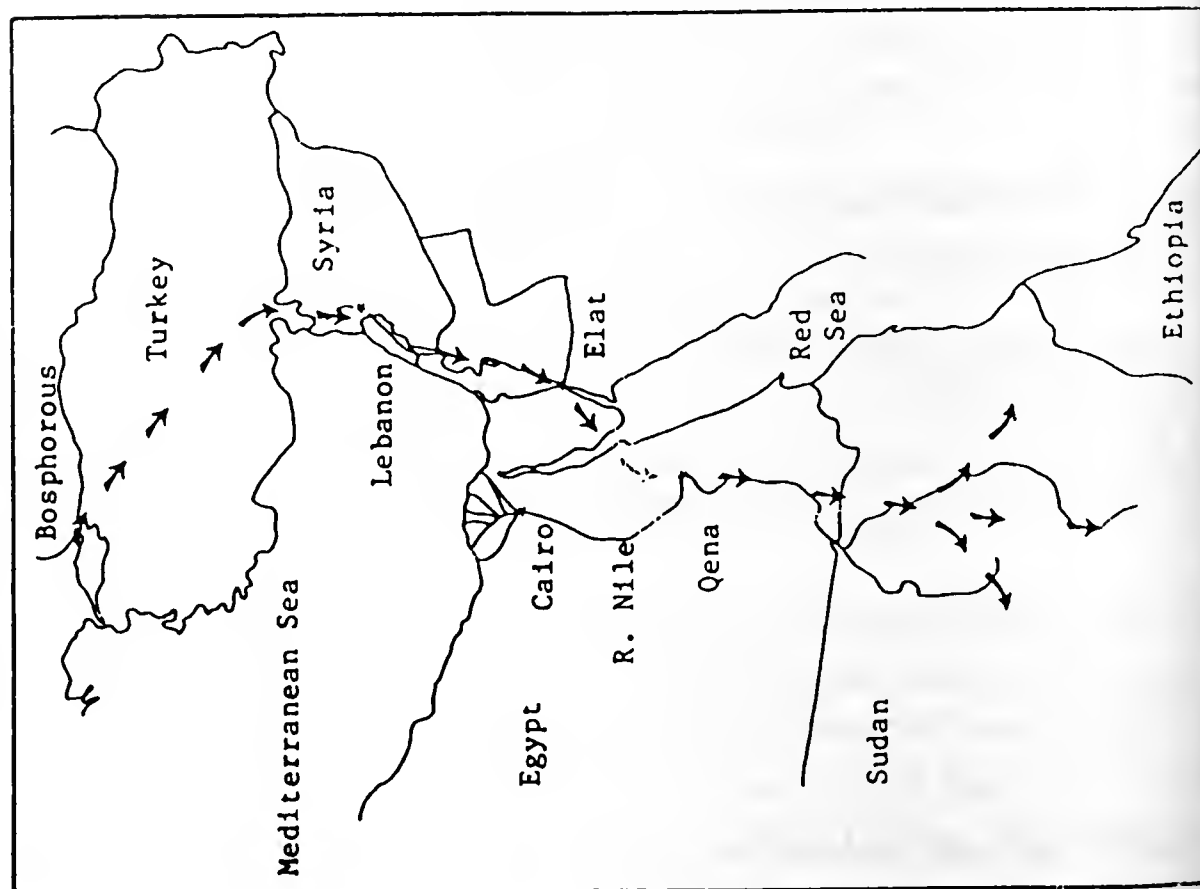


Figure 1 The main overwintering sites of the White Stork (*Ciconia ciconia*) in Africa. Arrows show the approximate autumn migration routes from Europe and the Maghreb.

Eastern migration



Western migration

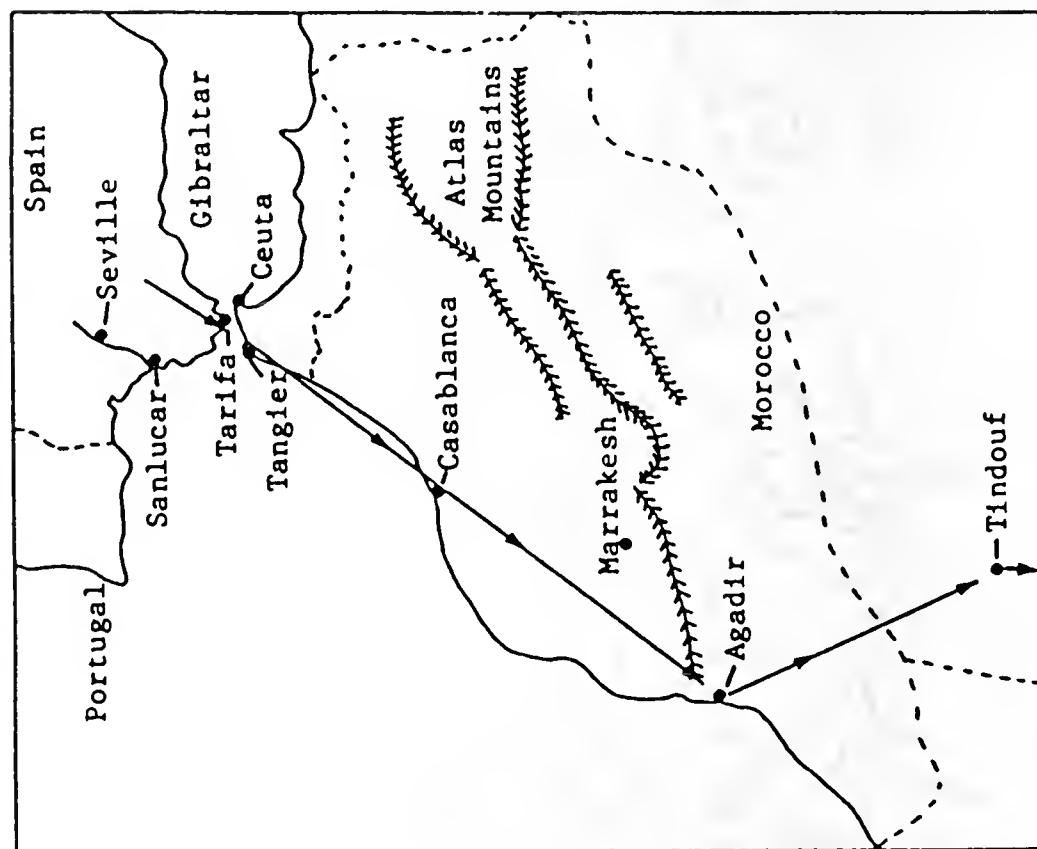


Figure 1 (contd.) Eastern and Western migration routes of the White Stork shown in greater

In other countries on both the eastern and western migration routes the White Stork is protected by cultural respect, for example in Israel, Algeria and Tunisia. In Israel the most frequent reported cause of death is collision with over-head cables. In addition, pesticide use in Israel is very high and likely to affect the storks at their stop-over sites. The main worry on the migration routes is habitat loss, through man-made drought, water regulation and agricultural development.

It is, however, in the African wintering grounds that the over-riding problems are to be found. Just how the environmental conditions in Africa affect the White Stork's survival there has been graphically and clearly discussed by Dallinga & Schoenmakers (1987), to whose publication the reader is referred for an in-depth account of the problems outlined below.

The greater decline of the western population can be understood when one realises the enormous extent to which drought and habitat alteration have depleted the food resources of the White Stork in West Africa. Drought has hit West Africa particularly badly, reducing the supply of migratory locusts which were once the primary food of the stork in sub-Saharan Africa. This affect has been augmented by intensive anti-locust campaigns.

Up until 1960 storks arrived in West Africa in August and spent two to three months in the southern Saharan breeding grounds of locusts and grasshoppers, taking advantage of the insect swarms before they migrated farther south. The current situation in West Africa is somewhat different. Twenty years of heavy, indiscriminate use of pesticides to control locusts almost completely eradicated the insect and if outbreaks do occur now they are quickly dealt with by use of Dieldrin. Consequently the White Stork has been forced to winter in more southern savannas where locusts are naturally less abundant. The birds become scattered in small groups and in attempts to find food they concentrate around drying pools to eat fish; also around bush fires, where again they come under severe hunting pressure (Thiollay, 1983).

Reduced food supply is not such a problem in East Africa. Firstly, the areas important to storks have been less hard hit by drought. Secondly the 'eastern' population arrives in Africa at the beginning of the rainy season when insect abundance is at a maximum, whereas the 'western' storks arrive at the end of the rain when the food supply is running out, and thirdly, the potential wintering area is very much larger in the east. A small number of 'western' storks winter in the northern-most parts of Cameroon but countries farther south (i.e. Gabon, Equatorial Guinea and Congo) are all mostly covered in tropical rain-forest and have little suitable habitat for White Storks (Schulz, 1988). The 'eastern storks', on the other hand, have the whole length and breadth of East and southern Africa to scour for food, from the arid areas of Sudan where locusts are the main food source, to Kenya and Tanzania where armyworm outbreaks are important succour, to the natural wetlands of southern Africa

where lucerne moth caterpillars, small rodents and amphibians are eaten.

It is not just drought that has turned much of the west African Sahel into a sub-desert, much less able to support migrant birds. Over the past 30 years human populations in West Africa have exploded above the carrying capacity of the land, necessitating rapid changes in land-use and agricultural practices to meet the demands of the still-growing population. With conservation needs taking a back-seat, irrigation schemes and over-grazing (on top of the last 20 years of low rainfall) have had hugely deleterious effects on the landscape for wildlife, pushing migrants further south into sub-optimal areas. Linked to the increasing need for food, the White Stork is also threatened by poaching in West Africa. (Hunting pressures are minimal, if they exist at all, in East Africa.) There is also growing concern in West Africa about the undesirable effects on wildlife of the increased use of pesticides against agricultural pests of rice, cotton and sugar cane, and about the chemical control of pests such as the tsetse fly (Thiollay, 1983; Walsh, 1985).

Conservationists know that the only long-term solution to the decline of the White Stork is an improvement in the conditions on African wintering grounds. Stricter legislation and subsequent enforcement is needed in areas where hunting and the indiscriminate use of chemicals is a problem and attempts must be made to manage the environment so that the needs of both man and wildlife are reconciled.

It is no surprise that despite the efforts of some Europeans to tempt back the lucky White Stork, the birds are not returning in the spring as they once did.

In one West German village, Stapelholm, traditional farming methods are being maintained to provide feeding grounds for the storks. Five thousand acres of marshland have been set aside to build up the numbers of frogs, which form a significant proportion of the storks' diet. Furthermore, electric cables are run underground to prevent storks from flying into them and special nesting platforms are erected to overcome the problem of the loss of nest sites; new buildings are often unable to support storks' nests.

Artificial nests have been put up elsewhere, with encouraging results. Over half of Hungary's 4,774 pairs of White Storks nest in 'nestbaskets' which have been mounted on telegraph poles, sufficiently raised above the cables to prevent electrocution (György Kállay, pers. comm. 1989).

There was a glimmer of hope in France in the spring of 1989, when between five and eight new pairs of White Storks nested, four of them on artificial platforms erected by the French Bird Protection Organisation, LPO, in the Charente-Maritime region.

It had to be accepted, however, that such attempts, intended to help restore the White Stork to its former status in northern and western parts of Europe by habitat conservation on the breeding grounds, would not work on a big scale

This presented Europeans with a dilemma: the extinction of the White Stork in Europe was dependent on factors operating in the migration and wintering countries. Should they therefore accept this extinction *or* should they try to save this much loved and admired species by programmes involving captive breeding and subsequent release? Such programmes have been, and still are being developed in northern and western Europe, despite the argument of many conservationists that this kind of manipulation of, and interference with nature is wrong and may, in the long term, cause "fundamental injuries for nature and species conservation" (Rheinwald, 1985).

The first experiment in White Stork re-introduction was in Switzerland. An experimental station was set up in 1948 and by 1985 there were a total of 22 sub-stations from which 32 'free pairs' were known to have bred (Bloesh, 1985). The basis of such programmes is that captive storks lose the urge to migrate, although in theory their offspring will still do so. This experiment paved the way for similar such experiments in other countries.

After the erection of artificial nests to attract White Storks in Holland had failed, the Dutch Bird Protection society, in its 70th anniversary (1969), set up a 'Stork Village' - 'Het Liesveld' - in Groot-Ammers, 30km east of Rotterdam. As in Switzerland, the aim was to breed storks at a main station and release them in pairs at substations (or 'buitenstations') in environmentally favourable areas.

The Dutch primary station started with 18 storks and the project developed rapidly. In August 1989 there was a constant population of about 240 at 'Het Liesveld' and in September of this year the 12th substation was opened. The only full-time member of staff working on the project is the manager of 'Het Liesveld', Mr A W Smits. Otherwise, the operation of the sub-stations depends on enthusiastic volunteers. For example, the Director of the project, Mr Kees Vos is an airline pilot and in his spare time runs the sub-station at Herwijnen. The project is financed mainly by gifts and through various fund-raising activities, including an 'Adopt a Stork' scheme: an offer which has been taken up by HRH Prince Bernhard of the Netherlands and in 1989 Mr Vos adopted the project's stork number 1000.

The standard rearing procedure at 'Het Liesveld' (described by Vos 1985) is to place pairs in cages (10m x 10m x 2m) with a low-standing nest to breed in. A recent advance which has greatly increased pairing success has been the refinement of sexing techniques involving chromosome tests, which are now more than 90% reliable. Offspring of the captive pairs have to be 'grounded' for four years, (i.e. until they reach sexual maturity) since only pairs of storks are released or moved to other stations. The birds are grounded, firstly by wing-clipping (for two years) and for a further two years with wing-bands. The bands are swapped between wings every eight weeks to prevent stiffening of the muscles.

The storks are hand-fed all the year around, being unable to forage for themselves. The feeding regime is strict, with daily afternoon feeds of chicken, mice and rats. It has been found that during very cold periods extra food must be given to the storks early in the morning in order to "activate" them.

At 'Het Liesveld' some of the pairs are kept to perpetuate the population there, whilst others are used to set up sub-stations, a process which began in 1978, when numbers in the main station had increased sufficiently to move some storks out with the hope of eventually releasing them. The sub-stations are carefully chosen so as to provide adequate nesting and feeding areas. Each has two 2m-high cages with nests ready to receive a pair of storks from the main station. This happens in the autumn and the pair is accompanied by 4 one-year 'ground storks', which are put into the enclosed area surrounding the cages. After allowing six months for the birds to accept their new environment the pair is released and the sub-station's cages re-stocked from either the 'ground birds' or from the main station. It is found that the adult pairs do not migrate when set free, being used to having winter feeds at the main station, which are continued at the sub-stations. Instead they occupy one of the nearby artificial nests which are specially erected for this purpose. Quickly it becomes a self-supporting system. The captive birds may also be added to nests of wild storks if only one of the wild pair returns to the nest. Any offspring the released pair have subsequently should still have the urge to migrate and indeed, particularly when several young are produced in a sub-station, they do leave the nest area in the autumn (as a group). However, whether they are able to migrate 'properly' to Africa is doubtful. Vos (1985) reports that some supposedly migratory storks went only as far as Belgium, just 140 km.

The Dutch project is certainly succeeding in increasing the numbers of White Storks in the Netherlands and the prospect of being able to set up new sub-stations and replenish the main station seems to be a reality. The Dutch estimate that their country has room for 25 sub-stations and that this number might allow a self-sustaining population to be established and the main station closed down.

Similar but less ambitious projects exist in Belgium, Sweden and West Germany. The feral population of White Storks at the Zwinn reserve at Knokke, Belgium, originate from birds imported from southern Europe in 1957. As in Holland the storks are fed throughout the winter. Eleven pairs bred in 1989 and six young fledged. The young rarely attempt to migrate.

In Sweden the hope of a recently set-up breeding programme at Karups Nygard is that the experimental storks might be joined by some of the vagrant White Storks which visit Sweden each May; about 20 birds from East Germany, Poland and the Baltic States, perhaps eventually re-establishing the White Stork as a breeding species in Sweden (Jönsson, 1989).

In 1976 a re-introduction centre was established at Hunawihr, near

Ribeauville in Alsace, France, with one hundred White Storks supplied by a captive breeding programme at Strasbourg Zoo. The Hunawihr centre is particularly concerned with public education; the storks are very tame and people can learn about stork biology and conservation at the Visitors' Centre. The birds fly freely, in a vast aviary of more than one third of an acre, enclosed by a net held up by the tops of the trees. Artificial nests have been erected among the trees. Some of the captive storks have been used to re-populate previously used nests in Alsace and some are being paired with wild birds.

As well as stocking the Hunawihr centre, Strasbourg Zoo has been releasing White Storks within Strasbourg itself; for the first time in thirty years storks have been seen in the city. Breeding is closely monitored and manipulated by two couples, the Gangloffs and the Schmitts. They put in "lots of hard work and around the clock presence" but are rewarded with a high level of success: in 15 years 378 storks have been reared (Gangloff & Schmitt, 1985). 'Double-clutching' is a method used to increase the numbers of eggs. This involves the first clutches being removed and artificially incubated. The parents usually lay again and the second clutches remain with the parents. This all happens in incubators in the Schmitt's house but at three weeks old the chicks become too large and are moved to the Gangloff's basement garage where there are large nests on the ground. There they remain for a further three weeks before being transferred to the zoo, into outside nests well away from the public.

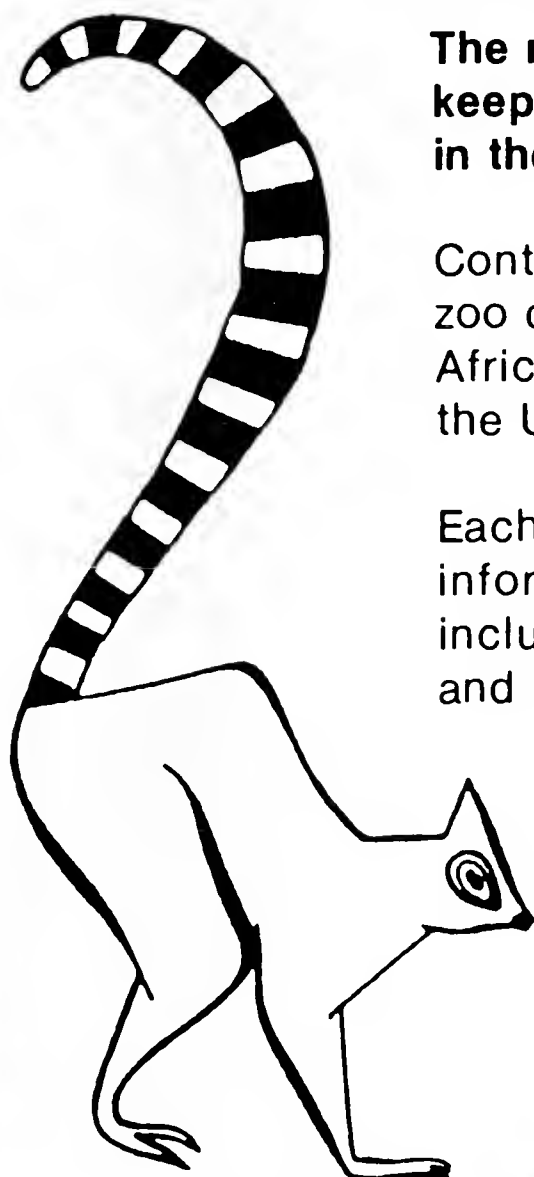
The ultimate aim of many, if not all of these re-introduction centres is to reduce the captive programmes as soon as a self-sustaining population is reached but even then there is doubt whether these 'new generation' birds will ever behave as do truly wild storks. Perhaps this is an academic point anyway, since unless significant changes occur in the African wintering grounds in favour of the White Stork, the need to maintain European stocks by captive breeding will never cease. The White Stork will remain on a permanent 'life-support machine'. Apart from keeping the species alive for scientific research and for our children and grand-children to see, the efforts of such reintroduction projects might be largely in vain, the unavoidable truth being that the White Stork is a victim of what man, to an ever greater extent, is doing to our environment.

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Breeding female Greater Vasa Parrot (left) with the two 1990 fledglings.

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NOTES ON THE BREEDING AND BEHAVIOUR OF GREATER VASA PARROTS *CORACOPSIS VASA* AT CHESTER ZOO

By: Roger Wilkinson

(Curator of Birds)

Vasa Parrots occur only in Madagascar and nearby islands and relatively little is known about their breeding, biology and behaviour in the wild or in captivity.

The genus *Coracopsis* comprises only two species: the Greater Vasa Parrot *Coracopsis vasa* and the Lesser Vasa Parrot *Coracopsis nigra*. The Greater Vasa Parrot is sometimes simply referred to as the Vasa Parrot and the Lesser is also known as the Black Parrot.

Both species are similar in having a rather dull blackish or greyish-brown plumage and unusual in their loud song-like calling - although to my ear that of the Greater Vasa is less attractive than the song of its smaller relative. Neither species is presently considered endangered but the island race of the Lesser Vasa *Coracopsis nigra barklyi* occurring on Praslin I., is one of the world's most endangered Parrots.

Chester Zoo has successfully bred Lesser Vasa Parrots since 1985 but similar success with the Greater Vasa has, until this year, eluded us.

A pair of Greater Vasas were purchased from a private collection in February 1985 and, since then, have been held in one of the outside aviaries close to Oakfield House. These were surgically sexed and the female wore a gold and the male a black metal leg-band.

Their aviary, measuring 4.5 x 4.5 x 2.2 metres, has a solid back wall and is partly covered. No additional shelter has been necessary for these birds, which have proved to be quite hardy, although not yet tested by a really severe winter. Diet has been as for most of the other larger parrots and consists of a basic parrot seed mixture containing striped sunflower seeds, peanuts, pine nuts, wheat, safflower and maize, plus dry brown bread, and a general animal feed pellet (SDS Zoo Diet 'A'). Fresh fruit and vegetables, usually apples, pears, grapes, tomatoes and lettuce, are provided daily.

Since their arrival the pair had been provided with a grandfather clock-type nest-box which was half-filled with peat and wood shavings.

As for the Lesser Vasas, the Greater undergo a number of physical

changes in the breeding season. Both sexes show a change in bill colour with the bill paling to a whitish-brown and in full breeding condition both also show extensive cloacal protrusions although they are usually only visible on the males.

Unlike the Lesser Vasa however, the female Greater Vasa becomes bald-headed when breeding and the bare skin then revealed on the top of the head, around the eyes and on the throat takes on an ochre yellow colour. This must result from hormonal changes and is not caused by plucking by the male as has been suggested by one previous author. No extensive feather loss occurs in the male, although this year a small bag-like area of bare skin below the lower mandible was noticeable on one male.

The pair of Greater Vasas has produced eggs since 1987, but although the female spent much time inside the nest-box, the eggs were found outside on the aviary floor. In 1987 two eggs were found on the aviary floor on the 15th June and a third on 18th June. Dummy eggs were placed inside the nest-box to encourage the hen to lay there and the eggs removed for artificial incubation but proved infertile.

In 1988 two eggs were again found on the aviary floor, one on 4th June and the second three days later. Again the female spent much time on the nest-box and both eggs were infertile.

Similar behaviour was observed in 1989 but then a total of five eggs was laid on the aviary floor between 28th May and 8th June. That year a lot of chasing of the male by the female was also noted. This might have been the consequence of his not being in breeding condition at the same time as the female or a basic incompatibility between the two birds. Chasing of the males by the females, however, had been observed in the Lesser Vasas and appeared for them to be a normal part of their social behaviour and displays. The laying of eggs outside the nest-box and the fact that, for three years these were infertile however, indicated there was a real problem that could be related to incompatibility.

Accordingly a second pair of Greater Vasas were purchased in December 1989. These were of dissimilar size and we were assured they had been surgically sexed with the larger poor-feathered bird being the male. After a prolonged period bringing them into condition they were introduced into the aviary with our original pair on 9th April 1990.

In May 1990 the paling of the bills of all four birds showed these were coming into breeding condition. On 18th May the original gold-ringed female was noted to have lost feathers from under the bottom mandible. Copulations between the smaller new bird (previously considered to be a female!) and the original female were noted on 17th, 22nd and 23rd May. Mating occurred with the birds sitting side by side when both male and



R. Wilkinson

Female Greater Vasa Parrot showing extensive feather-loss on crown, around eyes and below lower mandible when breeding.



R. Wilkinson

Breeding female Greater Vasa Parrot bathing in water pool.

female showed everted bag-like cloacal swellings by which they were then locked together. The initiation of copulation was not seen in our pair but mating behaviour was described for his birds by K. Bowen as being "... the same as in any other species except that after a little while the cock shuffled on to the perch beside the hen, tails still entwined, and I truly believe their vents were still coupled!"

The female was observed spending a lot of time in the nest-box from 23rd May and full copulation was not seen after that date. Inspection of the nest-box on 25th May indicated the female was sitting on at least three eggs. On this and subsequent inspections, if not already in the nest-box, the female always flew straight into the box when the aviary was entered and stubbornly remained inside when the inspection hatch was opened.

By this time the female had begun to lose feathers on her crown and the skin in that area had turned flesh-coloured. On 28th May I watched the female fly out of the box to be fed, at first gently then vigorously with a strong pumping action by the new small male with which she had previously been seen to mate. At that time the small male was the only one of the four birds to show the very swollen vent typical of males in breeding condition. The female sang all the time she was being fed then flew into the nest-box only to quickly emerge and then be fed by the original black-ringed male. This male was then chased off by the new small male which took over the feeding of the female. The fourth bird then approached these two, making choking movements as if bringing up food which appeared to indicate it also wanted to feed the female.

On 10th June some egg shell was seen on the floor of the nest-box and chick sounds heard. At least one chick had hatched after an incubation period estimated to be around 18 days. The nest-box was checked four days later but the female sat tight and only allowed a view of two hatched egg shells, one unhatched egg and a chick's small foot protruding from under the brooding female.

Because of the female's behaviour chick development could not be easily monitored. However on 17th June one chick, estimated to be a week old or older, was clearly seen. It was noted to be about 13 - 14 cm long, totally bald and very ugly! A week later two chicks were seen, these had both opened their eyes and had signs of feathers appearing on their wings. These were accompanied by two unhatched eggs. Two days later pin feathers appeared over their bodies and they developed rapidly with flight quills of 7 - 8 cm visible on 2nd July and appeared well feathered a month later.

During the time the chicks were in the nest the diet was supplemented with commercial egg food and sprouted pulses. At that time the fruit intake increased greatly and additional apples and pears were provided.



R. Wilkinson

Eccentric posture assumed by sunbathing female Greater Vasa Parrot



R. Wilkinson

Two male Greater Vasa Parrots sunbathing.

By 17th June the female had lost all the feathers from the crown, around her eyes and on her throat. These areas were now coloured bright ochre yellow and the skin around her throat formed a conspicuous loose pouch. No head feather loss was noted on the males but the new small male that had been observed copulating with the female had developed a small pouch of naked pale skin below its lower mandible. This was not always visible and appeared either as ivory or yellow on different occasions.

The breeding female remained dominant over the three other birds in the aviary; chasing them, singing loudly and demanding to be fed. The sitting female was always fed in the aviary by the males and they never attempted to feed her inside or close to the nest box. The breeding female was clearly dominant over the other birds in the aviary and vigorously chased them singing and demanding to be fed. The new, smaller male was dominant over the original male and the larger newcomer was at the bottom of the social hierarchy.

On 21st June I took the opportunity to make notes on behaviour over a 30 minute period. On emerging from the nest-box the breeding female sang loudly then first approached the black-ringed male which fed and mounted her four times in the first five minutes of observation. The black-ringed male perched beside the female and vigorously pushed food into her upturned open bill. He then stepped onto her flattened back, balancing by pushing his closed bill so that it fitted snugly into her nape. Any cloacal contact was brief and this mounting differed from full copulation during which our parrots had been observed to have their cloacas locked together.

The new male which had a month previously been seen in full copulation with the female, perched only a metre away calling persistently. He then approached the female but was chased off by her before she returned to the black-ring male to be fed and mounted a further three times in quick succession. She then displayed with her wings drooped to the ground and her tail fanned and pointed skywards before chasing off both new Vasas and returning again to the black-ring male, which by now appeared to have no food left to offer.

Finding no food available for her favours she then chased the new small male around the aviary until he fed her, giving the black-ring male a chance to return to the food dish. Suitably gorged the black-ring male returned to the perch where it had previously fed the female. At that point the female transferred her attentions back to him and he again fed and mounted her nine times in a period of five minutes, alternating mountings with feeding bouts.

A strange, slow motion neck-snaking display by both birds then began in which the birds moved their heads in such a way that the female's head

was first to one side and then on the other side of the male's. This was followed by the male feeding the female then mounting her whilst still feeding her. A second bout of neck-snaking was then initiated by the female and copied by the male before she again demanded feeding. The male appeared to have again exhausted his ability to satisfy this female and she turned her attentions back to the new small male which again fed her then also briefly mounted her.

If one was allowed to be anthropomorphic this demanding mother appeared to be aggressively pursuing both males, demanding food and then reinforcing this by allowing them to mount her. After 25 minutes of this and a final bout of unsuccessfully demanding more food from the two chosen males, she flew to the nest-box from where the small squeaky calls of chicks were then heard.

Both males then took the opportunity to fly to the food and appeared to be selecting apples, which could easily and quickly be consumed. Although both active males fed separately no aggression was obvious between them, or between them and the fourth bird which had been excluded from this half-hour "soap opera".

On 22nd June that fourth bird was chased vigorously by the breeding female. The fourth bird appeared not to be in as good breeding condition as the other Vasas and had a greyer cast to its feathers. Perhaps because of this, but we suspected at the time perhaps because it was a female, it was attacked by the breeding female and on the following day had to be removed from the aviary. On later sexing that bird proved to be a male. For the greater part of the breeding cycle our group had then comprised one female and three males.

The first chick fledged on the morning of 29th July and the second that same afternoon. One of the chicks returned to the nest to roost that evening and over the next few days often only one chick was seen in the aviary. The young appeared identical to the adults but could be distinguished by the pale grey bare skin around their eyes and their very clean, white bills tinged pale pink. At that time the bills of the adults had begun to turn back to their darker, non-breeding colour.

The female continued feeding the chicks over the next few weeks and was very protective of them, chasing the males away if they ventured near. She still demanded food from the males but less frequently than when the chicks were in the box. By 8th August the yellow colour of the bare skin on her head had faded considerably and one or two pin feathers had begun to regrow. A week later her crown was like a pin-cushion covered in small pin feathers but although remaining dominant over the males, singing loudly as she occasionally chased them round the aviary, she was less concerned about them approaching the chicks. However, on no occasion were

the males seen to feed the chicks either inside or outside the nest. That was the sole prerogative of the female who during that period was fed exclusively by the males and was never seen to attempt to feed herself.

Rosemary Low, in a recent article in the *Avicultural Magazine*, briefly mentioned the propensity of Vasa Parrots to assume exaggerated attitudes when sun-bathing. During the period when this nesting was occurring the two males were often seen sun-bathing together, stretched out on the floor against the back stone wall of their aviary. Although their legs were often fully extended outwards and they lay on their sides, their attitudes were not so exaggerated as those assumed by the breeding female.

So strange were her postures that on several occasions we were alerted by visiting members of the public that a sick or dying parrot had been seen on the floor of the aviary. The most extreme posture even had me wondering about the bird's health when I saw her laid on her side with her lower wing stretched out backwards at a most awkward angle and her upper wing stretched out forwards. Her head was thrown back, her eyes closed or half-closed and her bill open whilst the bare skin on the throat of this bald parrot fluttered. Explaining to a layman that she was perfectly alright, just sunbathing and the baldness was normal during the breeding cycle and not a consequence of aggression was not easy. One visitor retorted: "It still looks sick to me".

Such is the fascination of Vasa Parrots, and not only sunbathing but also bathing in water is much enjoyed and again, some interesting poses are struck, including one in which the wings are stretched forward like a swimmer about to dive in the pool.

On one occasion I also watched the female playfully laying on her back with her feet in the air. My observations were too brief to then ascertain whether she was dust-bathing or just behaving in a playful fashion, closely watched by the Kea in the adjacent enclosure. To anyone who might still consider Vasa Parrots to be rather dull then I can only recommend that they keep and study them for they really are the most fascinating parrots.

ACKNOWLEDGEMENTS

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THE CAPTIVE BREEDING OF BLUE-BACKED FAIRY BLUEBIRDS *IRENA PUELLA* AT THE SAN DIEGO ZOO, CALIFORNIA, USA

By: Lorayne Haye

(Sr. Keeper, Bird Department)

The Blue-backed Fairy Bluebird *Irena puella* is a medium-sized passerine in the family Irenidae. It ranges throughout Southeast Asia and the Philippine Islands inhabiting densely forested areas where it can easily hide, being very shy and elusive by nature. The diet in the wild consists mostly of fruit such as guavas, berries and figs in addition to insects. The nest is constructed of small twigs and leaves neatly woven into a small cup which can hold between two to four eggs.

The first captive breeding occurred in the Edward Marshall Boehm Aviaries, Trenton, New Jersey, USA in 1963, reported by Everitt (1964). The second was at Keston Bird Park, England in 1965 (Pickett, pers. comm.).

The San Diego Zoo first exhibited a pair of Blue-backed Fairy Bluebirds in 1977. These birds were confiscated from a shipment that came out of the Philippines and were later purchased from the United States Customs auction.

In 1979, this pair went to nest and fledged two chicks. In 1986, this original pair of Fairy Bluebirds was moved to a 20 ft. x 15 ft. x 7ft (7m x 4.57 x 2.13m) aviary. The aviary was abundantly planted with Sword Ferns *Nephrolepis exalta*, Tubadanthus *Tupidanthus calyptratus*, Golden Bamboo *Phyllostachys aurea*, Banana *Musa sp.*, Staghorn Fern *Platynerium sp.*, Cotoneaster, Splitleaf Philodendron *Monstera sp.* and annual rye grass *Lolium multiflorum*.

Also inhabiting this enclosure was a pair of Malayan Argus Pheasants *Argusianus a. argus*, a pair of Golden-Fronted Leaf-birds *Chloropsis aurifrons*, a pair of Roul-Roul Partridge *Rollulus roulroul*, and a White-rumped Shama *Copsychus malabaricus*. Aggression was never a problem amongst these species, even during breeding season.

These birds were given a soft food pan that consisted of chopped apples, bananas, papaya, oranges, raisins and blueberries. The diet also included Bird-of-Prey Zoopreem (Central Nebraska Packing Inc.), soaked small dog kibble (Ralston Purina Co.), mealworms and various vitamin supplements. A "pheasant pan" was also provided, which consisted of Dr. Tom's pheasant pellets (Zeigler Bros. Inc.), oystershell, a few peanuts, chopped spinach, carrots, apple and mealworms and was placed on the ground for the Argus Pheasants and Roul-Roul Partridges.

On 22nd April 1986 a round bamboo nest basket 10 in. x 8 in. (25.4 x 20.32 cm) was placed in a secluded part of the aviary in a corner and

wired in place, approximately 5ft (1.52 m) from the ground. The bottom of the basket was lined with straw and a small handful of pine needles was spread on top. Additional pine needles were scattered throughout the aviary on the ground. Immediately after the nest was put into the enclosure, the female flew to the ground and began stacking pine needles in her beak. When the nest was completed, there was a smooth blanket of pine needles and leaves woven neatly into the shape of a cup within the bamboo basket. Courtship in the form of harmonious vocalizations, and allopreening was observed. However, copulation was never witnessed.

On 27th April, five days after the nest basket had been put into the enclosure, the female laid her first egg. The egg was light blue in colour and heavily spotted with brown on the large end of the egg. On 29th April, the second egg was laid and incubation commenced. The female was solely in charge of the incubation duties. The incubation period lasted fourteen days, during which the male stayed on the opposite side of the aviary. Both the male and the female could be heard vocalizing throughout the day.

On 13th May, during early morning rounds, the female was stacking mealworms in her beak and darting back to the nest. Upon checking the nest, only one chick was there. The fate of the other egg or chick was never known. During this time, mealworms were given four to five times per day. The standard soft food pan was given but the contents were doubled. The female was the only one observed feeding the chick and the male again kept his distance.

On 23rd May, eleven days after hatch the chick fledged. Plumage was a dull verditer blue. The bird completely lacked a tail, had scant primaries and grey down upon its chest. The flight exhibited was so ungainly that for the first four to five days it hopped from branch to branch rather than trying to fly. The female was attentive in her feeding duties. She was observed feeding the chick worms, Zoopreem, the assorted fruit mixture and the soaked dog kibble. Feeding by means of regurgitation was never observed.

By 11th June (19 days after fledge), the chick had started to develop a darker blue colour and the eye had begun to change to a red colour, as in the adults. By this time, the young bird had also started to take on the shape of an adult, with the primary and tail feathers present.

On 19th June, 1986, 28 days after the first chick fledged, the female laid her first egg of the second clutch. The second egg was laid the following day and incubation commenced. At this time, the chick from the first clutch had begun to feed itself. However, when one of the adults would land nearby, the first juvenile would exhibit frantic begging behaviour. This begging behaviour was quickly ignored as on 4th July the second

clutch hatched, and the parents had no time to feed the begging chick. There were now two new chicks and for the first time the male was observed participating in the feeding duties. The hatchlings had such voracious appetites that the parents would stack their beaks with mealworms and together fly to the nest. This continued for five to ten minutes approximately every two hours for the first seven days after hatch. The seventh day seemed to be the most demanding for the chicks' feeding regime. This was probably due to the onset of fledging. On the 8th to 10th day, their appetites dropped as I observed the parents' feeding schedule was cut by about half. On the 11th day after hatch, both chicks had fledged and were observed perching in the trees, upon early morning rounds. At this point, I had noticed aggression between the male and the fledgling from the first clutch. It was decided to transfer the young bird to another enclosure. This pair went on to successfully rear yet a third clutch in the 1986 breeding season, bringing the total number of young reared to four. All the aforementioned clutches had the same incubation period of 14 days. Hatch to fledge was 11 days.

Conclusion

The Blue-backed Fairy Bluebird is a beautiful addition to any collection, be it a zoological facility or for the private aviculturist. I believe that given the right environment and necessary food items, it will breed quite readily in captivity.

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**BREEDING THE MEALY AMAZON PARROT
AMAZONA FARINOSA FARINOSA
(BODDAERT) AT OBERHAUSEN ORNITHOLOGICAL
INSTITUTE, WEST GERMANY**

By: Werner Lantermann

Introduction

Until 1980, when Rosemary Low's book "*Parrots - their Care and Breeding*" was published, there was very little known about Mealy Amazons. They were rarely kept in captivity and no breeding success had been recorded. After 1980 the situation changed because more Mealy Amazons were imported to Europe. Nowadays, these parrots can be found in many parrot collections, bird parks and specialized zoological gardens. Nevertheless breeding successes are still a great rarity.

A Mealy Amazon of the nominate race was successfully reared in the Oberhausen Ornithological Institute (Institut für Papageienforschung, IPF, Oberhausen) and this success will be described in this article.

Grouping, care and management of the adult birds

Between 1981 and 1986, the Institute acquired five adult Mealy Amazons of the nominate race from private owners, who had difficulties in keeping their parrots. A sixth bird was supplemented as a loan from Oberhausen Animal Park. The parrots were housed two by two in separate indoor/outdoor aviaries, according to their "sympathy" relationship. Unfortunately, the parrots later were defined by laparoscopy as five males and only one female. So there was only one pair and two "male pairs" in the Institute. The varying of the dominance relationship of one of these "male pairs" is already described and discussed by Lantermann & Wildschrei (in press).

The second "male pair" became more and more aggressive with the start of the breeding season and behaved like a real pair, with one bird showing dominance and one showing submissiveness (see Lantermann 1990, in press).

The parrots of the third pair were unmistakable with regard to plumage and body, and differed only slightly with regard to their weight although they exhibited strong morphological differences. The weight of the male was 660 g, the female's 635 g.

In 1987, this pair was obviously interested in the nest-box, but the female did not start laying in that year. In 1988, the birds had two non-fertile eggs in April, which were followed by a second unfertilized clutch in June. The eggs could not be found when examining the nest-box in August; it was not possible to find out whether they had been eaten by the birds or crushed and buried.



Werner Lantermann

Young Mealy Amazon Parrot at 78 days old

The care and nourishment of Amazons at the IPF has been reported several times by Lantermann (1987, 1988, 1989 in press) and therefore will not be repeated here. Over the years, the food had been adapted to the international knowledge of nourishment physiology (Aeckerlein, 1986). The share of fruit, vegetables and boiled legumes is about 50 % of the general food in the breeding season and while rearing the young birds.

Rearing a Mealy Amazon in 1989

In the spring of 1989 the Amazons got a new nest-box, which was filled with a 10 cm layer of wooden chips. Early in this year there were some non-fertile eggs again, which vanished until May. A following clutch was noticed on 3rd June which had probably been laid on around 21st May (with regard to the 27 day-breeding time in Burkart's *Amazona fari-nosa guatemalae*; see Burkart, 1985), because on 17th June the first begging sounds of a young bird could be heard.

Because of the aggressiveness of the adult parrots at this time, the first opportunity to look at the young Amazon was not until 29th July. The chick was about six weeks old at that time and had gone through the

greater part of its development by then. Its eyes were open and a first showing of its feathers on the belly and back could be seen. The tips of the feathers of the wing were already some millimeters in length. Its beak was a light horn colour with a dark tip on the upper mandible.

Especially striking were the strong legs and feet which seemed a little out of proportion to the rest of the body. When, trying to take the bird out for a photograph, it showed itself quite strong and was difficult to restrain. It struck a lot with its wings to keep its balance on the smooth surface. When taking the bird back to its parents, it showed no damage from this incident.

A second investigation was made on 11th August. At this time, the young Amazon was fully fledged and the feathers of the tail were about 25-30 millimeters in length.

On 12th August, the bird made its first attempt to leave the nest-box with the help of its beak.

At a further check on 20th August, the feathers of the tail were also developed to full length.

On the morning of 26th August, 70 days after hatching, the young bird left its nest-box.

It seemed to be quite awkward and tried to get a hold on the steel bars of the cage and on the perch. It was smaller than its parents and its plumage was duller. Like the parents it had some little yellow feathers on the crown. Its eyes were dark: the pupil black, the iris dark brown and in an outer circle, light brown. In contrast to the adult parrots its upper mandible was very broad.

The parent birds carefully guarded the young bird with the female sitting next to it in the nest-box and the male joining them at every hint of danger in the surroundings of the aviary. When visitors approached the cage, the adult parrots disappeared in the nest-box and were not seen for a long time afterwards.

When the young Amazon was taken out of the cage on 26th August for further photographs, it reacted rather aggressively, and tried to bite and to flee. It uttered some growling sounds which increased with its rising fear. The parents were lured to the front of the cage by those sounds and started to cry loudly and to show aggressive tendencies. When the young parrot got back into the cage, the parents showed aggression towards the young Amazon by striking its head and beak with their beak.

Conclusion

This rearing of a Mealy Amazon, which seems to be the first of the nominate race in Western Germany, is the sixth Amazon species to be reared within eight years in the IPF Oberhausen.

Looking at the chronological sequence, in 1982 there was the first

breeding of the Green-cheeked Amazon *Amazona viridigenalis* in Germany (Wozniak & Lantermann, 1984), in 1984 the breeding of the Blue-fronted Amazon *A.aestiva* (Lantermann, 1987), in 1985 the Yellow-crowned Amazon *A.ochrocephala belizensis*, in 1988 the Lilacine Amazon *A.autumnalis lilacina* (Lantermann, 1988) and in the same year the Panama Yellow-fronted Amazon *A.ochrocephala panamensis* (Schröder & Wagener, 1989). It is to be hoped, that the other four Amazon species which are kept in the IPF in the moment, will start breeding and rearing also.

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SUCCESSFUL PROPAGATION OF NICOBAR PIGEONS, *CALOENAS N. NICOBARICA* USING HOMING PIGEONS AS SURROGATE PARENTS

By David Oehler

(Cincinnati Zoo & Botanical Gardens, Ohio, USA)

The pair of Nicobar Pigeons *Caloenas n. nicobarica* at the Cincinnati Zoo and Botanical Gardens repeatedly failed in nesting attempts and attempts to rear young. With the use of homing pigeons as surrogate parents we had hoped to be able to give the Nicobar squabs an initial, healthy start before attempting any hand-rearing. The incubation procedure using two sets of surrogate parents was implemented and proved successful. Whether the squabs were to be left under the care of their foster parents also had to be determined. Sufficient time under their care was needed to assure survival. Due to size differentials and possible rejection more than the minimum weeks would also prove undesirable. Two squabs were produced using this procedure.

The Nicobar Pigeon, with its elongated neck feathers and iridescent green plumage, is a spectacular member of the order Columbiformes. Its natural diet consists of seeds, fruit, plus some invertebrates. Nesting occurs 3 - 10m above the ground in colonies numbering up to several thousand birds (Goodwin, 1983). In 1979, the Nicobar was listed under Appendix I by the U.S. Fish and Wildlife Service. Other sources report the Nicobar is almost extinct in parts of its home range of Indo-Australasia, (Maruska, 1987).

While several institutions have bred this pigeon well in captivity, hand-rearing techniques have been developed due to the rejection of eggs by certain birds. Artificial incubation at a temperature of 37.2°C and a wet bulb of 29.4°C was used. An artificial diet of Borden Esbilac with small quantities of Gerber High Protein baby cereal and Vi-Penta multivitamin drops was fed replacing the cereal with monkey chow at three weeks old. (Bell 1981).

The Cincinnati Zoo received a six-month old male Nicobar Pigeon in March, 1976. A four-month old female was obtained in October, 1983. The pair was set up in an exhibit measuring 2m x 1.8m x 3m high. The cage utilised sets of large skylights augmented with dual 40w Vitalights.

A diet of premix pigeon seed, dried fruit, hard-boiled egg along with a mix of soaked dog show, peanut butter and cottage cheese was offered throughout the day. Only the dry seed mix was available *ad lib*. Vitamin supplements in the form of Necton-S, Necton-Bio and Neo-Calglucon (during peak egg production) were added to the fruit mix.

No breeding activity occurred until 1986. Aggression from a pair of Tawny Frogmouths, *Podargus strigoides plumiferus* inhibited any courtship or nesting behaviours. Several weeks after the Frogmouth's removal, courtship behaviour was observed. The male began to parade around the female repeatedly, calling and displaying his ornamental neck plumage. Both birds began to break off branches of the exhibit's plantings, consisting mainly of arbutus, then transporting them to a nest-box located in the upper corner of their display. The nest-box, constructed of plywood, measured 30cm square. The front of the box was open and had a 4cm lip to hold the contents of the nest.

On March 9, 1986, the first egg laid by the pair was found broken. Two more broken eggs and an expired three-day old squab were found throughout that year. In 1987 the problem persisted with more broken eggs until the decision to pull any further eggs was made.

Artificial incubation was attempted as was the hand-rearing technique described by Bell. The squab died after three days.

8th May, 1987: an egg found was removed and placed under a pair of homing pigeons. Approximately ten days before the Nicobar egg was expected, the homing pigeons were allowed to nest. When the Nicobar egg was laid, the homing pigeons also had one egg. The two eggs were then switched. The incubation of a homing pigeon egg is 17 days (Carter), much less than the 28 days required by the artificially incubated Nicobar egg. Fifteen days into the incubation the egg was moved under another pair of homing pigeons and hatched on 5th June. To ensure survival through the first few critical days, the squab remained with the surrogate parents until 10th June. The squab's morning weight on the following day was 39 grams. Three feeds a day of 5cc per feed began and increased in volume with the growth of the squab. The formula consisted of 1 part Esbilac, 1 part Beech-Nut Stage 1 rice cereal and 3 parts water. The squab grew rapidly and was on its own within two months of hatching. Another egg was placed under the surrogate parents on the 17th July. The egg hatched on 12th August, 1987 and remained with the surrogate parents for 12 days. The second squab weighed 78 grams, 14 grams less than the first squab at the same age. At two months old the second squab fledged and was eating without assistance.

Successful propagation of Nicobar Pigeons through the use of homing pigeons as surrogate parents was accomplished. Several pairs of surrogate parents are necessary so the entire incubation period of the egg is provided for. The optimum time the squab is left under the surrogate parents is crucial. Three to four days under the surrogate parents is necessary to pass the first critical stage. The squab should be taken before 10 days old so that a slowed rate of growth is not seen, as shown by the second squab.

When dealing with an endangered species, new procedures must be provided to insure its successful propagation. Whether this pair of Nicobar Pigeons proved unsuccessful, due to the lack of a colonial setting or due to individual idiosyncrasies, is not known. What is known is that surrogate parenting, in cooperation with hand-rearing, has proved to be a viable route by which to insure the success of propagating this species in captivity.

I would like to acknowledge the keepers of the Bird House at the Cincinnati Zoo and Botanical Gardens for their care of the Nicobar Pigeons and their offspring. Also, we are indebted to Dr. Thomas Angel, Jr. of the Angel Animal Hospital for his expertise and the use of his homing pigeons.

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GROWTH AND DEVELOPMENT OF A CAPTIVE GREAT INDIAN BUSTARD *CHORIOTIS NIGRICEPS* CHICK

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Introduction

The Great Indian Bustard *Choriotis nigriceps* (Aves: Fam. Otidae) once had a wide distribution and was present in the Indian subcontinent in most of the short-grass plains. At present owing to habitat destruction and hunting, the Bustard is an endangered species and listed in Schedule I of the Indian Wildlife (Protection) Act of 1972. It is extremely rare in Pakistan (P. D. Goriup, pers. comm.) and in India is present in only six states, with a total population of about 2,000 birds (Rahmani and Manakadan, 1985; 1988; Rahmani, 1987; 1989).

Growth and development of the Bustard chick is not fully known since (i) it is very difficult to study in the wild, and (ii) this species has not been successfully bred in captivity. Bustards are bred in captivity. Out of 22 species in the world, only a few have bred in cages, for instance the Australian Bustard *Choriotis australis* (White, 1985), the Little Black Bustard *Afrotis atra* (Gregson, 1986), the Houbara Bustard *Chlamydotus undulata* (Phillipe Goucher, pers. comm.), the Great Bustard *Otis tarda* (Osborne, 1985) and Buff-crested *Lophotis ruficrista*, White-bellied *Eupodotis senegalensis* and Kori *Choriotis kori* bustards (P. D. Goriup, pers. comm.)

Regarding the Great Indian Bustard, the Jodhpur Zoo in Rajasthan State of India had success in rearing chicks caught from the wild, but no data has been published about their growth, food and behaviour. During our studies on the Great Indian Bustard (see Rahmani 1987; 1989; Manakadan and Rahmani, 1989) at Rollapadu in Andhra Pradesh state of India, we reared and kept records of a Bustard chick picked up by a villager, who found it in his crop field. We reared the chick from an estimated age of 20 days to 429 days, after which it was killed by some vandals. A record of its weight and height increase and other developments was kept. Weight was recorded until 382 days by a commercial double pan balance nearest to 1 g. After that, as the bird became too big and would struggle on the pan, a spring balance with 100 g graduations was used. The bird was suspended by a cradle-like structure with openings for the legs while being weighed. Measurement of height was difficult, and not very exact, due to the various postures the bird took.



Asad R. Rahmani

Two months old Bustard chick being weighed on a pan balance

Captive Environment and Diet

Initially, the chick was kept in a 2x1 m chicken-coop type cage situated at the border of the Bustard area of Rollapadu. As the chick grew, it developed a habit of poking its bill through the mesh and injuring its bill and forehead, so it was transferred to a 5x4x2.5 m cage. This larger cage size somehow stopped its bill-probing activities. The cage had a floor covered with sand and was well exposed to sunlight except for some shade at a corner and a solitary bush. During mornings and evenings, the bird which became tame soon, was taken out for walks for exercise.

The food given was based on a trial and error method and from the information received from the Jodhpur Zoo. At Jodhpur Zoo, the Bustard was fed on a diet of wheat 'chappaties' (unleavened bread), greens, goat's liver and sometimes the chicks of the domestic fowl. At Rollapadu, the chick readily took to boiled eggs (sometime eating bits of the egg shell) and would eat nothing else, except insects. It regularly ate grit especially until six months old. It was fed twice a day i.e. in the mornings and evenings and during each feed it received about 30 to 50 grasshoppers. As it grew up, it needed more and more eggs, up to five eggs per day, but when it started accepting sorghum *Sorghum vulgare* 'chappaties' at about 220 days, the number of eggs went down. Around this time, it also started

*Ranjit Manakadan*

Bustard chick being fed a boiled egg

to catch prey on its own during its morning and evening walks, and this factor too probably had an influence on the reduction of egg intake. Details of its diet is given in Table 1.

Growth and Development

Details of growth in height and weight is presented in Fig.1 while Table 2 describes the changes in plumage as the bird grew. The salient features of our observations were:

1. Initially the chick fed bill to bill (food had to be directed to its bill). Gradually in stages, it was able to take food placed on the ground and only when about 200 days old was it able to catch prey on its own.
2. It knew how to handle prey. While it swallowed whole grasshoppers, stinging insects such as bees and wasps were killed and crushed at the tip of the bill before swallowing. At about 300 days old, it encountered a scorpion and killed it by repeated jabs with the bill, and pecked and broke the sting before swallowing it. It clumsily broke its first egg

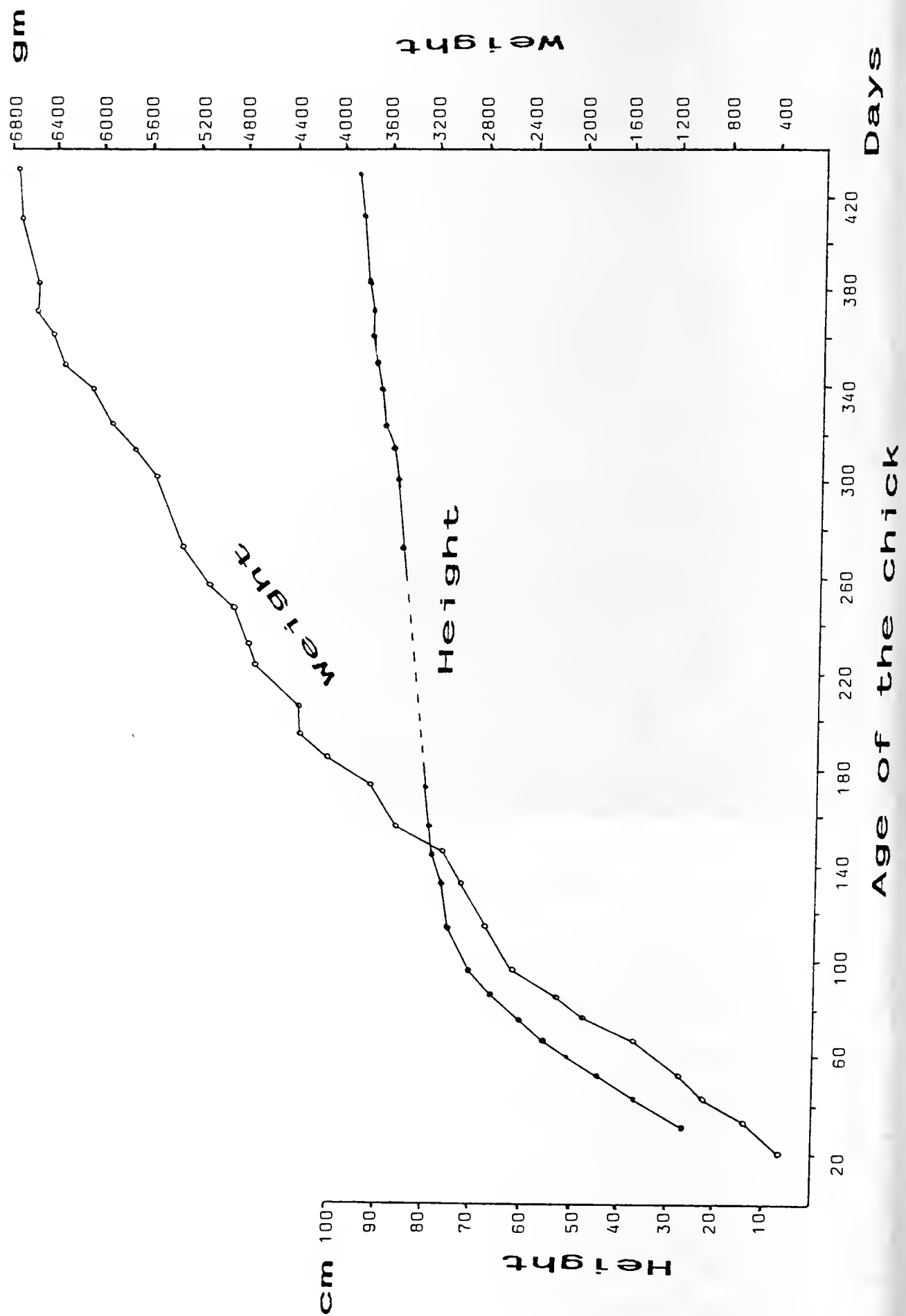


Figure 1: Development of Great Indian Bustard chick

Table 1. DIET OF GREAT INDIAN BUSTARD CHICK

Age in days	No. of boiled eggs		Grasshoppers	'Chappaties'
	morning	evening		
20-64	1	1	+	-
65-74	2	1	+	-
75-155	2	2	+	-
156-220	3	2	+	-
221-245	2	2	+	1.5
246-429	2	1	+	1.5

Note: In addition to grasshoppers, other prey eaten were: bees, wasps, ants, spiders, termites, beetles, preying mantis (including the ootheca), spiders, small skinks, geckos, eggs of ground-nesting birds and small frogs. It once swallowed a killed lark.

Table 2. PLUMAGE CHARACTERISTICS

Age in days	Plumage
20	Down feathers, with primaries and secondaries emerging. Down feathers dropping - bird preens a lot.
53	Semi-adult-like plumage, with black crest, neck and under parts impure white, brown mottled mantle and tail feathers. No breast band.
110	Breast band present. Crest more prominent.
210	Tail feathers white tipped.
260	Adult plumage. Breast band complete.
410	Looks almost an adult cock. Crest, extending to back of head. White supercillum having a lot of black 'invasions'.

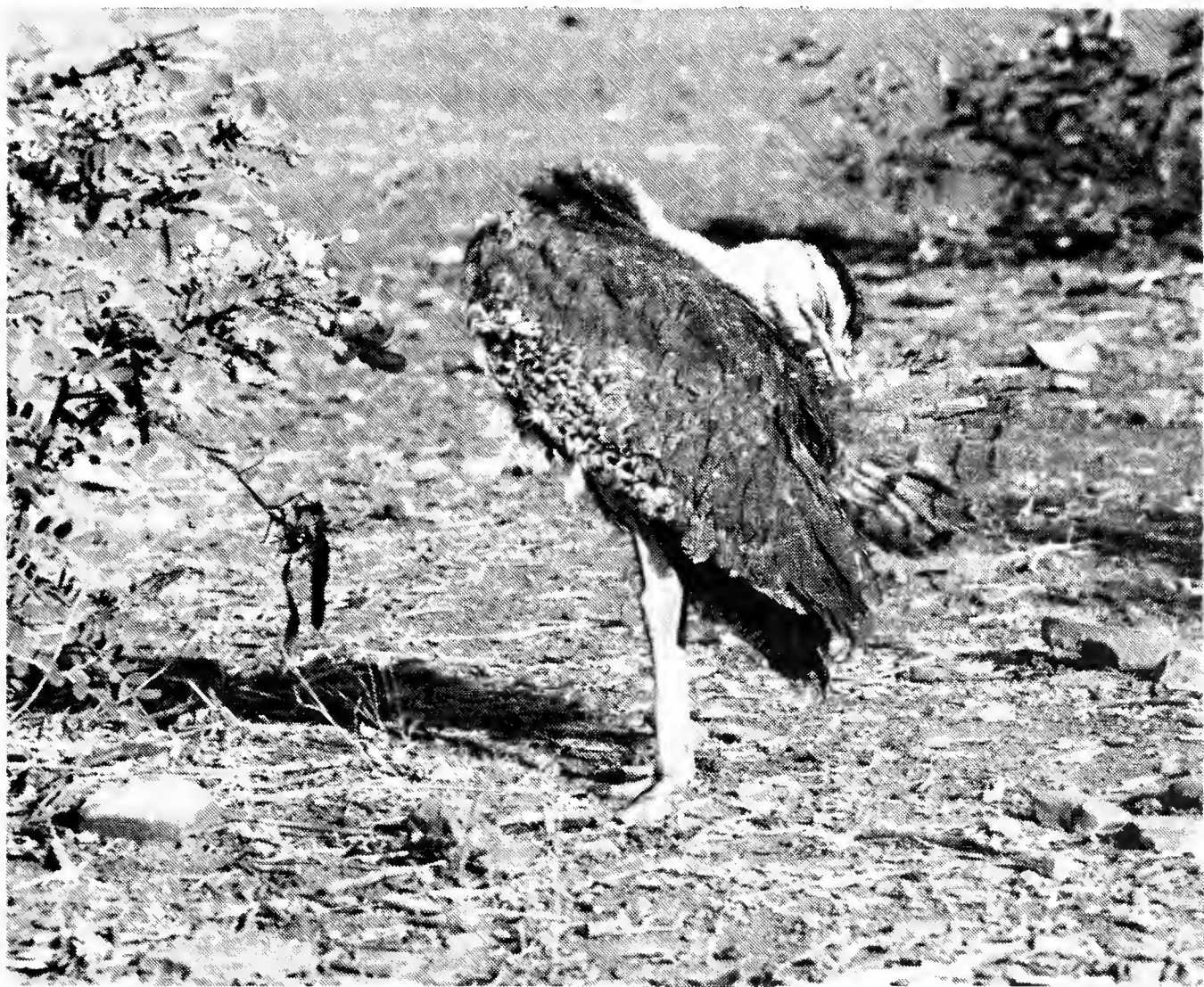
(Sandgrouse) with the tip of its bill thereby spilling the contents while further eggs were swallowed whole.

3. At the age of about 300 days the Bustard stopped eating the grasshoppers *Crotogonus* sp., while readily eating the species *Acorypha* sp. *Acorypha* is the most abundant grasshopper in protected grasslands, while *Crotogonus* is the most common grasshopper in grazing lands. We do not know the reason for this change in the preference of grasshopper species.

4. At 20 days, it had fear of potential predators such as harriers, crows and dogs. At about 60 days, it lost fear of harriers and crows, but even after a year old, retained its fear of large birds of prey.
5. At about 65 days, it was able to fly short distances but only after about 210 days old was it capable of good flight.
6. It had a low, moaning contact call, which it retained until about a year old.
7. It took dust baths regularly, first observed when 45 days old.
8. At about 50 days it was possible to sex the chick. It resembled a male with its comparatively thicker neck, dimensionally bigger head and throat, prominent black crest and erect walk (unlike the small bent, crouched walk of hens). By 100 days, there was no doubt about its sex, the distinguishing characters being more pronounced.
9. At 260 days, which coincided with the Bustard breeding season, this Bustard produced 'grr-grr' calls on a few occasions of very short duration when the booming calls of other displaying cocks were audible. In March, and at about 400 days old, coinciding with the second breeding season of the Bustard, it indulged in 1-5 minute displays early in the mornings, immediately on awakening. Displays consisted of cocked tail feathers, lowered wings and some foot movements. It emitted 'gkroo-gkroo' calls, during which the bill was pushed upwards at about an angle of 45°. There was no throat-puffing or any sign of a gular pouch as in adults. At the time, the bird stood 96 cm tall and weighed 6.7 kg, while adult cocks can reach 14 kg and stand more than a metre.

ACKNOWLEDGEMENTS

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Asad R. Rahmani

Two months old Bustard chick preening



Asad R. Rahmani

Bustard chick foraging, nearly a year old

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THE INHERITANCE AND LOSS OF THE STRAW DISPLAY IN ESTRILDID FINCHES

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Introduction

Courtship in many estrildid finches consists of holding a grass stem or feather by one end, and then bobbing the body rhythmically up and down by alternately stretching and bending the legs (the "inverted curtsy" of Morris, 1958). This is often referred to as the "straw display" and as evidenced by its frequent occurrence in all three tribes is probably phylogenetically "the oldest form of courtship" in estrildids (Goodwin, 1982:40). This display is lost altogether in some taxa, e.g. the Bicheno Finch *Poephila bichenovii* (Morris, 1958; Immelmann, 1982). However, a Bicheno Finch in our collection regularly performs the straw display. This has prompted us to bring together our observations and those of others indicating that certain individuals belonging to species that normally do not perform the straw display will on rare occasions perform the ritual. Moreover, different species differ in the number of components of the straw display that have been retained or lost. These data are of interest to students of evolutionary biology as they demonstrate how natural selection may operate in modifying dispositions to express behaviour patterns.

Variation in the straw display

The full straw display includes at least five different elements (Table 1), all of which are included in the displays of the African Silverbill *Lonchura cantans* and Indian Silverbill *L. malabarica*. In the introductory portion of this display, the displaying silverbill grasps the straw by one end, sleeks all its feathers, holds its body erect with its tail pointed straight down, then jerks its head up and down several times. Each jerk lasts about a second, and two or three seconds elapse between jerks. The head is jerked above the horizontal and then returns back to the horizontal or almost horizontal position (fig. 1A). The displayer is silent at this time. This movement is reminiscent of that observed when an estrildid is shaping the roof of the domed nest. This component of the display is probably derived from nest-building movements.

In the next portion of the display, the performer may lean forward so that its body is now at an oblique angle with the horizontal. The tail is now twisted towards the displayee, and the belly feathers may be fluffed to give it a "pot-belly" effect. It now performs inverted curtsies accompanied with song (fig. 1B). The straw may be dropped in the middle of the singing performance. The female signals readiness to copulate by quivering her tail.

The head-jerk portion does not appear to have been described in earlier

studies of silverbill displays (Kunkel, 1959; Güttinger, 1970). Morris (1958) mentions U-shaped movements of the head performed by silverbills. It is not clear whether or not he is referring to the head-jerk display.

Although the head-jerk portion may be left out altogether, males of both silverbill species regularly perform both head-jerk and inverted curtsies. A female *L. malabarica* in our collection regularly performed both head-jerk and straw display, but unaccompanied by song. She ceased displaying once she was paired with a male.

With the three cordon-bleus *Uraeginthus* spp., the head may be jerked up while performing inverted curtsies, i.e. head-jerks are coupled with inverted curtsies (Goodwin, 1965). The Star Finch *Emblema ruficauda* performs the straw display with inverted curtsey. Only before copulation does the head-jerk appear. However, only the female Red-browed Waxbill *Aegintha temporalis* performs the head-jerk, in response to the male's straw display (Immelmann, 1982). In silverbills the two movements are performed separately, and the head-jerk may be absent altogether (this study). Males of the Strawberry Finch (Red Munia) *Amandava amandava* may hold a straw or feather, then sing and bow slowly (Goodwin, 1960; pers. obs.). This is perhaps the homologue of the head-jerk display seen in silverbills.

Field and laboratory observations indicate that the Bicheno Finch has lost the straw display altogether and typically courts by fluffing its feathers and then performing many ritual beak-wiping movements against the perch (Morris, 1958; Immelmann, 1982). However, Mobbs (1985) reported Bicheno Finches displaying on perches by bowing while holding a straw. An adult male Bicheno Finch in our collection courts with sleeked body feathers, tail twisted towards the displayee, a straw held by one end, and inverted curtsies (fig. 2). Like Mobbs's (1987) birds, ours displayed in silence. Unlike Mobbs's, however, ours performed inverted curtsies and twisted its tail in the direction of the female.

The Painted Finch *Emblema picta* is another species which does not perform the straw display (Morris, 1958; Immelmann, 1982). Courtship consists of singing with rapid pivoting movements of the head accompanied by jerky, hopping movements towards the female. However, one individual in Webber's (1946) collection performed a full straw display, including inverted curtsies.

The Bengalese Finch (White-backed Munia) *Lonchura striata* does not perform the curtsey display (Morris, 1958; Eisner, 1957). However, on rare occasions the male may hold a straw by one end and "fly heavily about the cage with his breast and belly feathers raised" (Slater, 1970:315; pers. obs.), then drop the straw and perform his courtship display which consists predominantly of swaying movements of the body on a lateral

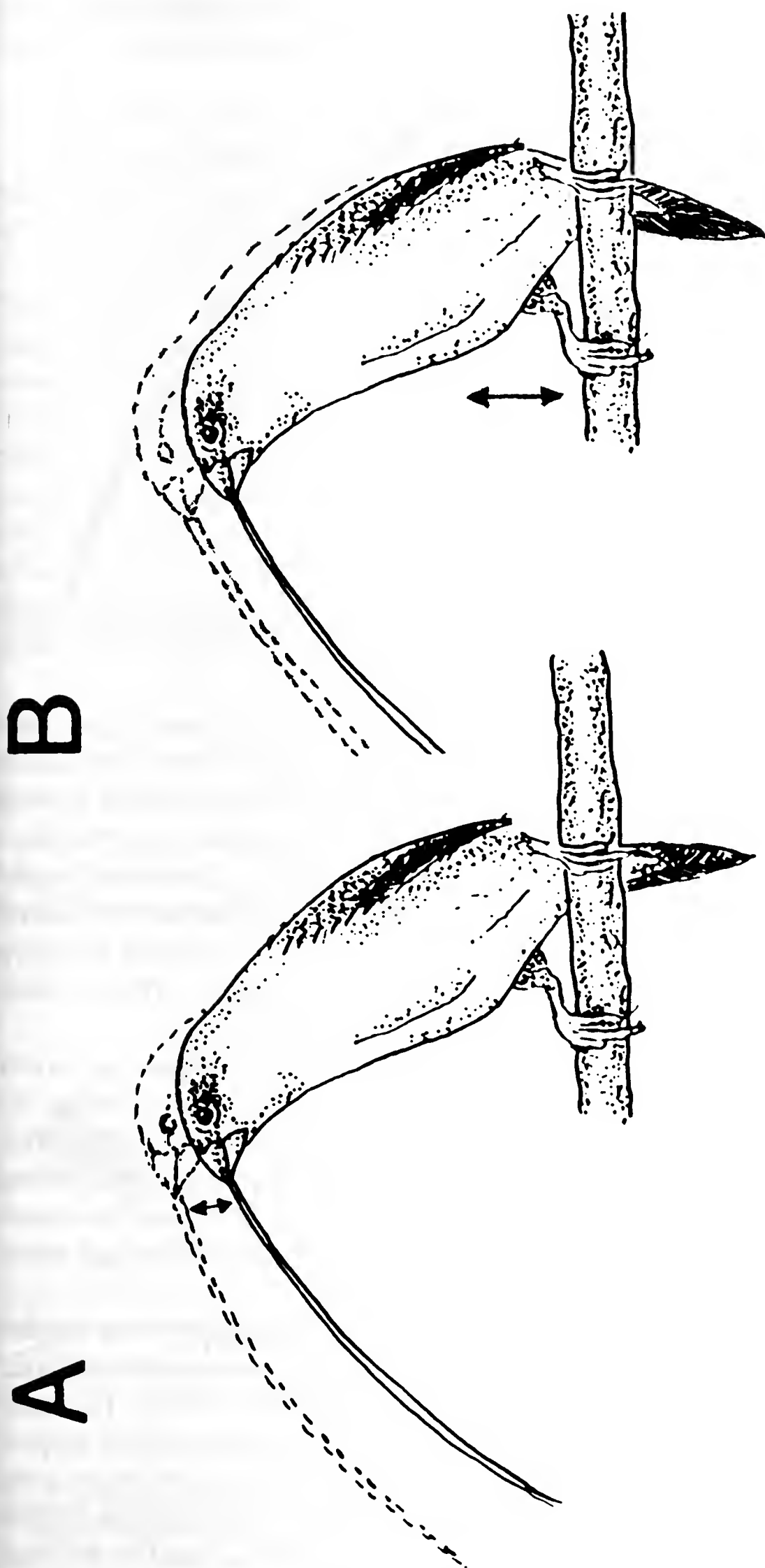


fig. 1. A. African Silverbill performing head-jerk component of display while holding a straw. B. The same Silverbill now performs the inverted curtsy display with the tail twisted in the direction of the female.

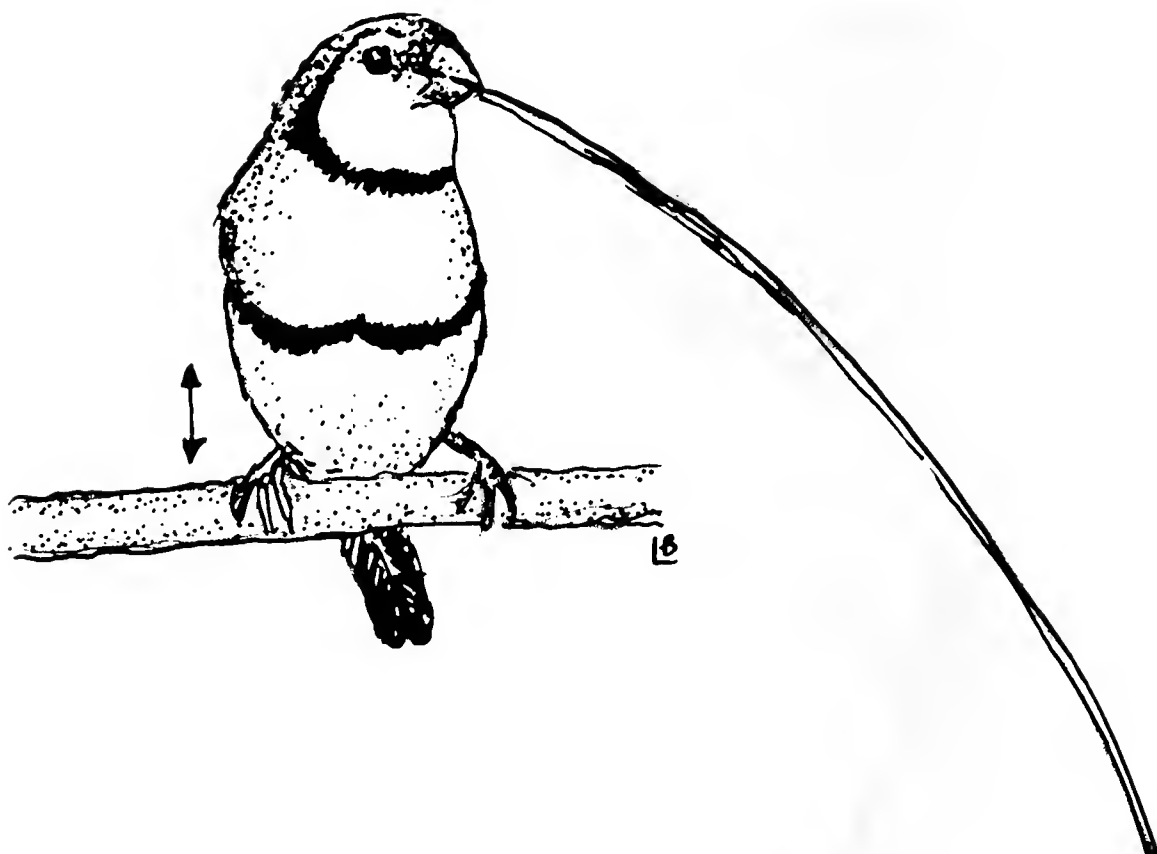


fig. 2. Bichenno Finch performing the inverted curtsey display while holding a straw and with the tail twisted in the direction of the female.

plane. The Spice Finch (Nutmeg Mannikin) *Lonchura punctulata* often performs inverted curtsies but without a straw. Again, some individuals may hold a straw and fly about as a preamble to the inverted curtsey (Moynihan and Hall 1954). The straw is dropped prior to actual displaying. The Zebra Finch (Spotted-sided Finch) *Poephila guttata* and Black-throated Finch *Poephila cincta* do not perform inverted curtsies. However, some juveniles may hold a straw as a prelude to their ritualized courtship movements (Immelmann, 1982; Sossinka, pers. comm.). This is more often seen in the Black-throated Finch than in the Zebra Finch.

The White-breasted Mannikin (Pictorella Finch) *Lonchura pectoralis* does not perform inverted curtsies, but does hold a straw during its courtship which is performed on the ground (Immelmann, 1982). This species has lost its song altogether, and utters two notes in its stead during its display (Hall, 1962). Bichenno Finches also tend to display in silence (Mobbs, 1985). Song appears to be used mostly in advertising and rarely in courtship (Mobbs, 1986).

In some species, e.g. the Pearly-headed Mannikin (Grey-headed Silverbill) *Lonchura griseicapilla*, some individuals perform full inverted curtsies with straw, but others never (?) do (Baptista, 1973). The male Diamond Sparrow *Emblema guttata* performs the inverted curtsey display holding a straw, then drops the straw, crouches and twists its head in the manner of a begging fledgling (Nicolai, 1962). Two birds in our collection never perform the straw display portion, but twist their head in the beg-

ging posture and in this position perform inverted curtsies. To our knowledge this has never been described before.

Heritability of the straw display

Studies of the displays of hybrids indicate that the straw display is heritable. Eisner (1958) and Harrison (1962) reported on courtship behaviour of African Silverbill x Bengalese and Bengalese x African Silverbill crosses and noted that the hybrids performed the inverted curtsey with straw. Two hybrid *L. cantans* x *L. striata* that we observed also performed the head-jerk of the silverbill, but sometimes held a straw and bowed low almost touching the perch, the latter a preamble to the display of the Bengalese (fig. 3A; Table 2). Additionally, although during the initial phase of the curtsey display our hybrids held the tail closed and twisted in the direction of the female, this soon passed on to a spread tail, characteristic of the Bengalese (fig. 4). However, the tail was pointed down like the silverbill and not up like a Bengalese (compare fig. 1B and fig. 3B). These observations indicate that raising and spreading of the tail are not necessarily coupled and may be expressed as distinct units.

Two *L. malabarica* x *L. striata* hybrids performed full straw displays including head-jerk, inverted curtseys and tail-twist. However, the hybrids occasionally performed a slight nod or incomplete bow before displaying, a characteristic of *L. striata*. Neither hybrid sang during the display.

The inverted curtsey is absent from the display of the Bengalese Finch but is present in that of the Spice Finch and their F1 hybrids (Table 2). In the F1 hybrids, the tail is pointed down and is not spread.

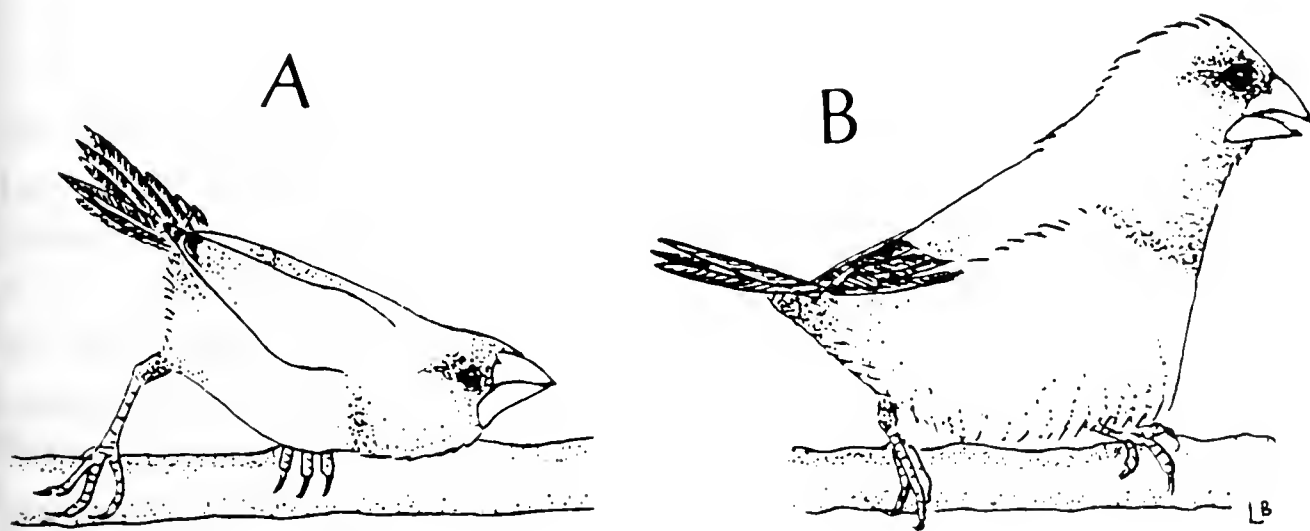


fig. 3. A. Bengalese performing the introductory bow. B. Bengalese performing full courtship display with bill opening and closing, nape and belly feathers raised and ruffled, and tail spread and raised. (Fig. 3A redrawn from Morris, 1958).

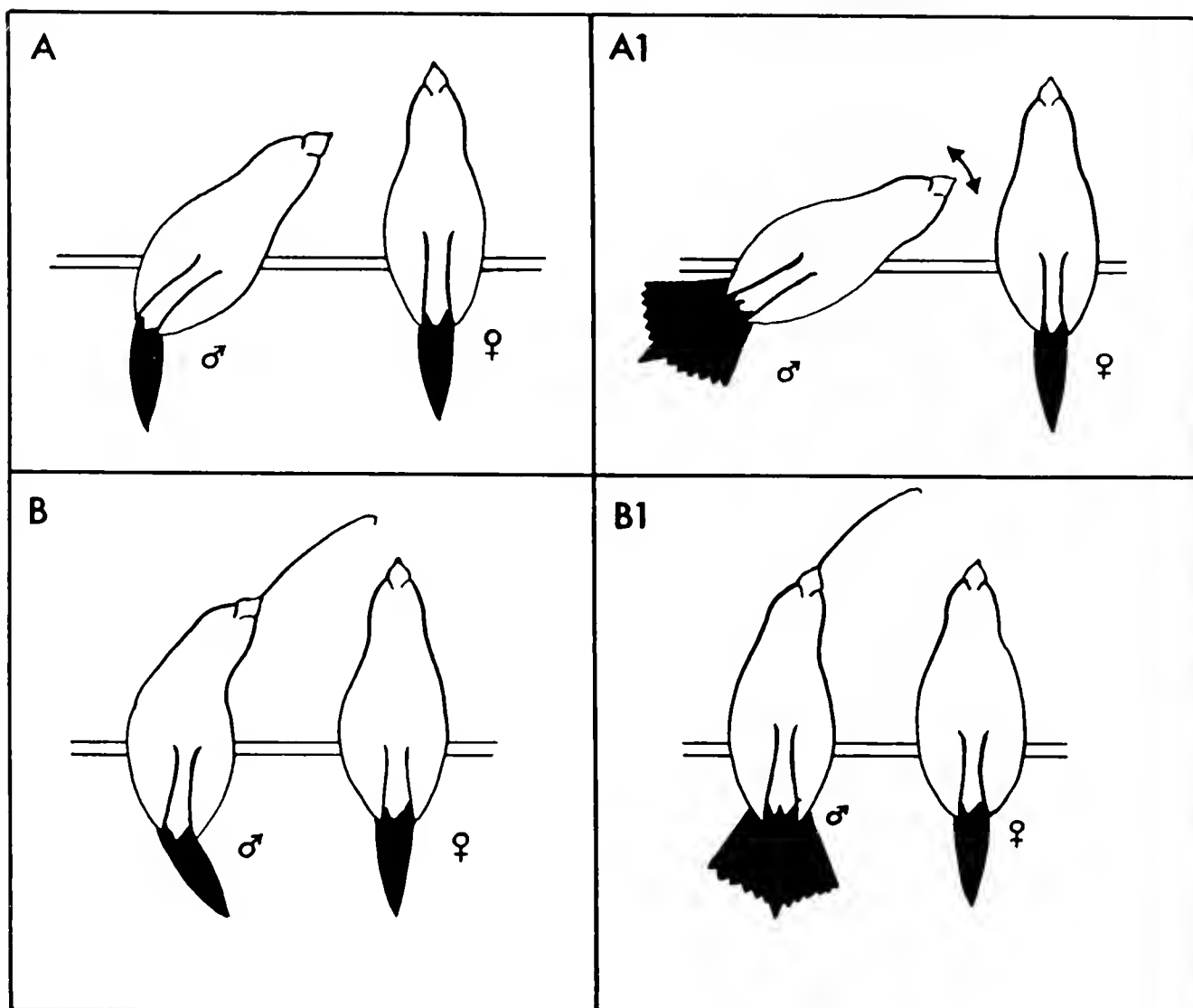


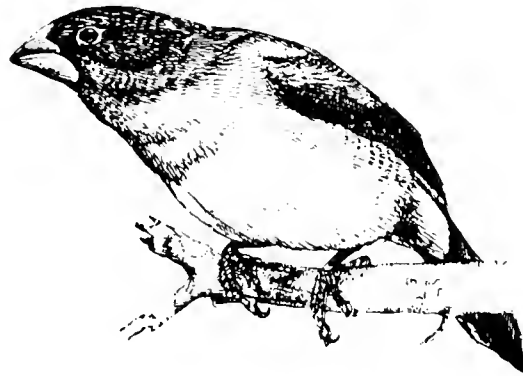
fig. 4. Displays of African Silverbill x Bengalese hybrids. A. Hybrid performs horizontal song display with tail twist. A1 - The tail is spread in the middle of the performance but is not raised. B. Hybrid performs straw display with inverted curtsy and tail twist. B1 - The tail is spread in the middle of the curtsy display.

Hybrids between the African Silverbill and Zebra Finch perform the straw display of the silverbill including head-jerk straw-holding and inverted curtsy. However, the feather postures are more similar to those of the Zebra Finch parent (fig. 5). The silverbill sings or displays with none of the feathers ruffled, although the feathers of the belly may be fluffed to produce a "pot-belly" effect (fig. 5). The Zebra Finch displays with nape and belly feathers ruffled (fig. 5). The hybrid African Silverbill x Zebra Finch performs the straw display with nape, belly and lower breast feathers ruffled. Ruffling of the lower breast feathers is present in the displays of neither parental type.

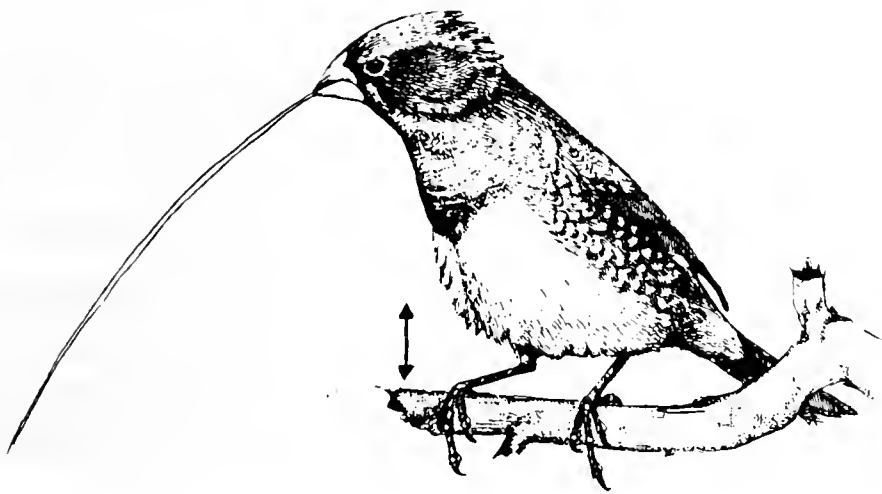
African Silverbills perform a second display during which the body is held almost horizontally in relation to the perch (fig. 5) and in this posture the male sings with the head moving slowly from side to side on a hori-



A



B



C

fig. 5. A. Courtship display of Zebra Finch with nape and belly feathers raised and ruffled and bill opening and closing. B. Horizontal song display of African Silverbill. Note the belly feathers raised to form a pot belly and the closed bill. C. Straw display of hybrid African Silverbill x Zebra Finch.

Note the raised and ruffled feathers of the nape and belly similar to the Zebra Finch, but ruffled lower breast feathers not found in either parental type. (Redrawn from Welty and Baptista [1988],

fig. 9-2)

zontal plane and with the bill hardly open. The Zebra Finch sings with exaggerated opening and closing movements of the bill. The silverbill x Zebra Finch hybrid most often sings with the closed bill of the silverbill, but with the feather posture more similar to the Zebra Finch as in the straw display described above.

African Silverbill x Bengalese hybrids also perform the horizontal song display of the silverbill, but this is preceded by a deep bow similar to the Bengalese. Again the display begins with the tail closed, but soon passes on to a tail spread posture typical of Bengalese Finches (fig. 4) but down-pointing like a silverbill. The belly feathers of the hybrid are sometimes raised and ruffled as in the Bengalese.

Field observations on the courtship display of the White-bellied Mannikin (White-headed Munia) *Lonchura leucogastra* have been made in the Philippines by Ronald Krupa (pers. comm.) who noted that males perform the straw display with inverted curtsies. Three *L. striata* x *L. leucogastra* males bred by us performed both inverted curtsies (as in *L. leucogastra*) and lateral pivoting movements of the body (as in *L. striata*). Their tails were spread but pointed down and straws were not held. One of these hybrid males was mated to his *L. leucogastra* mother. The backcross looked identical to a pure *L. leucogastra*, and it performed inverted curtsies holding a straw.

Another *L. striata* x *L. leucogastra* male was mated to a female *L. striata*. Two male and two female offspring were produced which looked identical to *L. striata*. The two backcross males performed full Bengalese displays including spread and raised tail, ruffled belly and nape feathers, bowing, and lateral pivoting movements of the body. However, lateral body pivoting was sometimes interspersed with single inverted curtsies. Thus, although the backcrosses looked and behaved like Bengalese, the inverted curtsy from their father's repertoire was not lost altogether, and was expressed in a "vestigial" form.

Discussion

In sum, the inverted curtsy with straw is an ancient display distributed widely across the three tribes of estrildids (Goodwin, 1982). Our observations on the displays of various hybrids and backcrosses indicate that this display is heritable. The fact that backcrosses to both parental forms in the case of the *L. striata* x *L. leucogastra* experiments produced progeny which looked and behaved like the species to which the backcross was made is further evidence in favour of a genetic basis for the species differences in behaviour described (Franck, 1974). One to as many as four of the five components comprising the straw display may be lost in various species (table 1), or may be expressed on rare occasions by species which have lost the display altogether (fig. 2). This indicates that although the

TABLE 1: Elements of the straw display appearing in twelve estrildid taxa arranged in order of decreasing number of elements retained.

Species	Straw	Head Jerk	Tail Twist	Inverted Curtsey	Song	No. Elements Retained	
<i>Lonchura cantans</i>	+	+	+	+	+	5	
<i>Lonchura malabarica</i>	+	+	+	+	+	5	
<i>Uraeginthus</i> spp.	+	+	+	+	+	5	
<i>Emblema ruficauda</i>	+	+	+	+	+	5	
<i>Aegintha temporalis</i>	+	-	+	+	+	4	
<i>Lonchura punctulata</i>		±	-	-	+	+	3
<i>Amandava amandava</i>	+	+	-	-	+		3
<i>Poephila guttata</i>	-	-	+	-	+		2
<i>Lonchura striata</i>	-	-	-	-	+		1
<i>Lonchura pectoralis</i>	+	-	-	-	-		1
<i>Emblema picta</i>	-	-	-	-	+		1
<i>Poephila bichenovii</i>	-	-	-	-	-		0

TABLE 2: Elements of the straw display appearing in six estrildid taxa, their hybrids and backcrosses. Data partially from Baptista 1981.

Species	Head		Tail	Inverted		Tail		N ¹
	Straw	Jerk	Twist	Curtsey	Song	Bow	Spread	
<i>Lonchura malabarica</i>	+	+	+	+	-	-	-	12
<i>Lonchura cantans</i>	+	+	+	+	+	-	-	11
<i>Lonchura punctulata</i>	±	-	-	+	+	+	-	7
<i>Lonchura striata</i>	-	-	-	-	+	+	+	38+
<i>Lonchura leucogastra</i> ²	+	?	?	+	+	?	?	1
<i>Poephila guttata</i>	-	-	+	-	+	-	-	12+
<i>L.cantans</i> x <i>L.striata</i>	+	+	+	+	+	+	+	2
<i>L.malabarica</i> x <i>L.striata</i>	+	+	+	+	+	±	-	2
<i>L.punctulata</i> x <i>L.striata</i>	-	-	-	+	+	+	-	12
<i>L.cantans</i> x <i>P.guttata</i>	+	+	+	+	+	-	-	5
<i>L.striata</i> x <i>L.leucogastra</i>	-	-	-	+	+	+	+	3
<i>L.straita</i> x <i>L.leucogastra</i> x <i>L.leucogastra</i>	+	-	+	+	+	-	-	1
<i>L.striata</i> x <i>L.leucogastra</i> x <i>L.striata</i>	-	-	-	± ³	+	+	+	2

1. No. of individuals studied.

2. Personal communication from Ronald Krupa.

3. Single curtsies occasionally observed.

disposition to perform this display is lost in part or in its entirety in some species, the genes controlling the expression of this display are retained but their action is blocked in some way. Similar observations have been made on the courtship displays of dabbling ducks (Anatini) by various authors who also observed that behaviours rare or absent in various duck species may be present in the displays of their hybrids. For example, many anatid drakes perform a display called the "down-up" during which the drake dips its bill into the water and then suddenly lifts its bill skywards, producing a plume of water in the process. This display is absent in the Pintail *Anas acuta* and South American Green-winged Teal (Chilean Teal) *A. flavirostris* but appears in the courtship of their F1 hybrid (von de Wall, 1963; Lorenz, 1965). Hybrids between Mallards *A. platyrhynchos* and Gadwall *A. strepera* were backcrossed to a Mallard. The progeny perform a display known as "bridling" which is absent in Mallard, Gadwall and their F1 hybrid (Kaltenhäuser, 1971). Some authors (Lorenz, 1965; Kaltenhäuser, 1971; Manning, 1979) have suggested that during the course of evolution behaviours are not lost but that new sets of genes cause the raising of the threshold to perform these behaviours which are then rarely expressed. The effects of these genes are reduced in the reorganized genome of the F1 hybrid, thus lowering the threshold and permitting the expression of these otherwise rare behaviours.

Although the observations of the above authors may be correct, other explanations for these phenomena are also possible. For example, it could be that during the course of evolution modifying genes arise which block the action of genes controlling the expression of a certain display. The action of these genes is removed in the F1 hybrid or in occasional mutants which may regularly express an otherwise rarely observed behaviour. This schema does not require the postulation of raised behavioural thresholds.

Another possible explanation for the loss of a display is that its expression is under polygenic control so that if during the course of evolution one or more of the genes is lost then that display is no longer performed. For example, we could postulate that the "down-up" display, so widespread among anatids (Kaltenhäuser, 1971), is controlled by the gene complex "abcde". If the Pintail genome only includes "bcde" and the *A. flavirostris* genome only includes "abcd", then neither species will perform the display. If during the course of hybridization the ancestral "abcde" complex is reconstituted, then the "down-up" display will once more be expressed.

We thank Derek Goodwin, Sylvia Hope and Michael Ghiselin for their comments on earlier drafts of this paper.

Summary

The "Straw Display" is a courtship ritual distributed across all three

tribes of estrildid finches and is probably a very "ancient" behaviour. Evidence from displays of interspecific hybrids and backcrosses indicate that this behaviour is heritable. It is lost in part or in its entirety in various estrildid species, however, single individuals of species not known to perform the "Straw Display" may occasionally perform this ritual. Various theories regarding the genetic basis of behaviours and their loss are discussed.

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CHARACTERISTICS OF CAPTIVE-BRED HYBRID FALCONS AS TRAINED BIRDS

By Dr. Sterling Bunnell

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Although falconry is primarily a form of hunting sport, many of its techniques have been adapted to the conservation and restoration of endangered or declining species of raptors, notably the Peregrine (see, e.g. Crdaswick, *Avicultural Magazine*. 91:79-92), Aplomado Falcon, Mauritius Kestrel, Harris Hawk, White-tailed Sea Eagle, Bald Eagle, California Condor, Eagle Owl and Elf Owl.

In the past 20 years falconers have learned how to propagate falcons in captivity, both by natural breeding pairs and by artificial insemination. This has made available a dependable supply of peregrines for reintroduction into the wild as well as birds for use in falconry. Other species of falcons have also been propagated, and many different hybrid crosses have been made through artificial insemination. The main purpose of these crossings has been to produce birds with unusual hunting abilities or disease resistance. However, the accumulating experience with these hybrids may be of interest to those concerned with avian behaviour.

The first reported instance of hybridisation of captive falcons was in 1971, in Ireland, when Ronald Stevens and John Morris placed a Peregrine tiercel (male) and a female Saker together in a loft. The birds mated and produced two hybrid eyases (nestlings). Since then, many hybridisations have occurred, mostly by artificial insemination, and mostly in North America. Many of these hybrids, crosses of most of the available falcon species, have been trained and flown as hunting birds. All types have shown hybrid vigour, a general increase in vitality which results from



1. *F. peregrinoides* x *mexicanus*) x (*mexicanus*) x *rusticolus* hybrid, male, adult plumage. Note the elongation often seen in hybrid falcons.

the greater array of genetic information present. Some combinations, especially the Peregrine x Prairie and Peregrine x Gyrfalcon, may be preferable from the falconry standpoint to their parent species, as will be described later.

Hybrid falcons generally have diminished fertility. Backcrosses of Peregrine x Prairie to Peregrine have as far as I know never produced living young, although attempted many times. However, Peregrine x Prairie has been successfully backcrossed to Prairie on several occasions. Triple hybridisations, in which an F1 hybrid is crossed with a third species, seem to be successful more often than backcrosses. For examples, see 16, 17, and 18 (below).

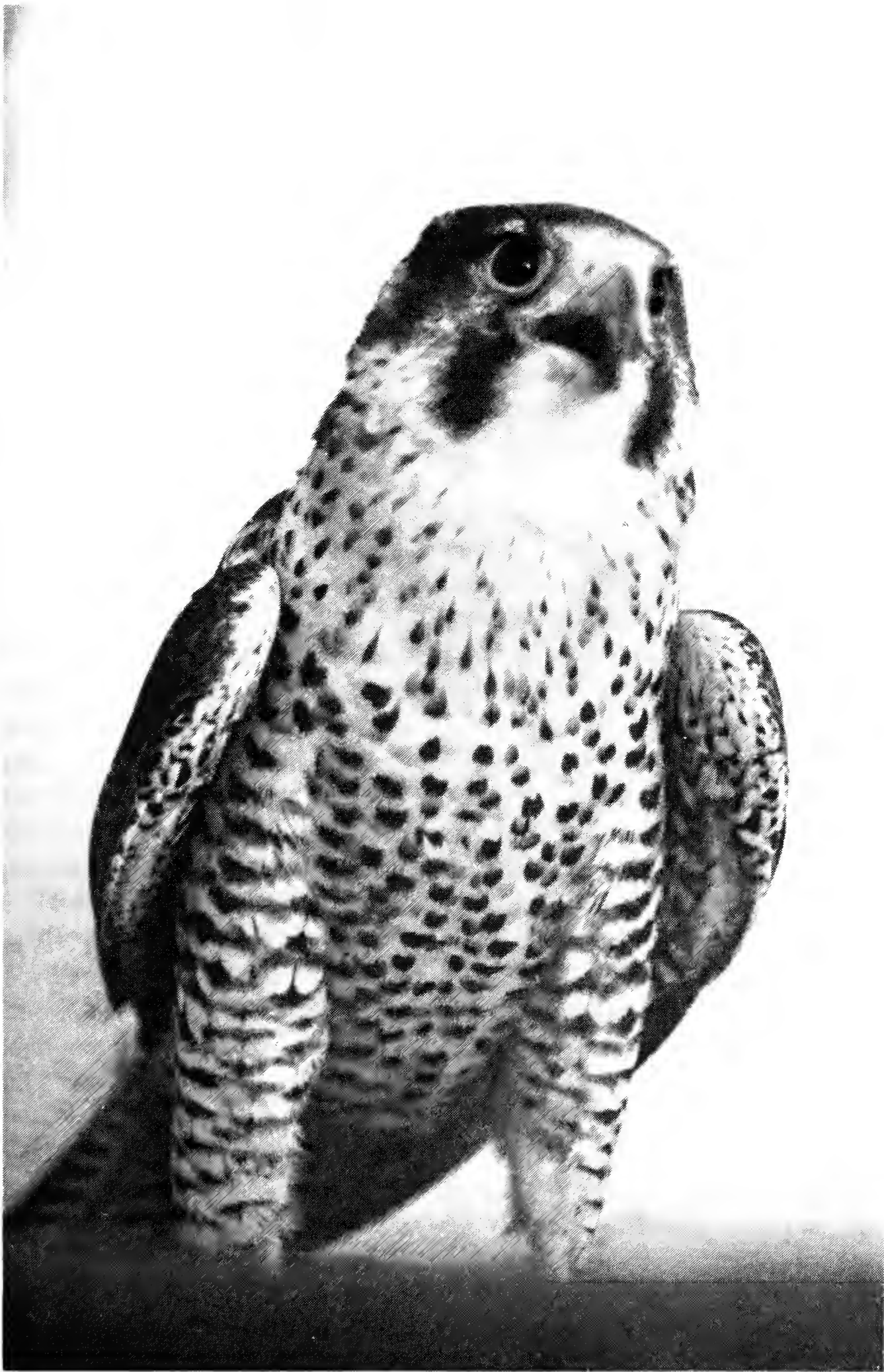
Eggs produced by crossing Peregrine with Prairie appear to be about as hatchable as straight Peregrine eggs produced by similar artificial insemination techniques, or perhaps slightly more so. Eggs of Peregrines crossed with Gyr seem to have a lower rate of hatchability, similar to that for Gyr crossed with Saker. Crossing Gyr with Prairie gives eggs that are reported to have an extremely low rate of hatchability.

Many hybrids have abnormalities of the female reproductive tract, such as incomplete development of the oviduct. Whereas the left oviduct is normally the functional one in birds, the functional oviduct was found on the right in one hybrid. Very few female hybrids have produced eggs although most males produce sperm. An exception is the *peregrinus* x *pelegrinoides* hybridisation, in which the F1s of both sexes are normally fertile.

Individual hybrids from a variety of crosses may show elongation of the body, legs and wings. Also common is an accelerated moult pattern, in which several pairs of flight feathers, especially in the tail, drop out simultaneously. Appetite may be greater than in either parent species. A few individual hybrids have shown various midline anomalies, such as asymmetries in coloration, wing size, bill shape, tail shape, or a patch of breast feathers on the dorsal midline.

Behavioural characteristics of hybrid falcons show dominance, suppression, facilitation, or mixing of various parts of parental programme. There is also the possibility of characteristics latent in a parent species being released in the hybrid progeny due to inactivation of a normal suppression mechanism. Hybrids often seem to relate to human beings more readily than the parent species do, perhaps in compensation for the ambiguity of the hybrids' innate programming.

In the following descriptions the custom of listing the species of the male parent first has been dispensed with since the data for many types includes progeny from both possible cases i.e. male x female and female x male. Also, parentheses are placed around the description of a hybrid when it is crossed with a third species.



2. *F. peregrinus* x *mexicanus* hybrid, female, adult plumage. The facial mask and breast markings are intermediate between the parental species.

The crosses I have observed as trained birds or have received reports about are:

1) *peregrinus* x *mexicanus* (Peregrine x Prairie). This is the most frequently produced hybrid. The Prairie lays eggs in captivity more readily than other large North American falcons. Breeders with egg-laying Prairies will often try to upgrade the progeny by inseminating with Peregrine sperm. The Peregrine x Prairie is probably the most generally useful hybrid as a trained falcon. Peregrine behaviour is dominant. For example, these hybrids are easily trained, wait on (circle overhead) at great heights, stoop very dramatically and effectively, and have an innate understanding of waterfowl which is brought out by experience. The main Prairie characteristic is a willingness to attack large quarry on the ground and kill it in a rough-and-tumble. They will sometimes bind (hold on) to ducks and go right into the water with them. They also seem to be intentional and premeditated in their hunting, like the prairie, rather than opportunistic, like the Peregrine. In straightaway speed I think they are faster than either Peregrine or Prairie reared in similar conditions (wild-caught birds have greater maximum speed than eyases), but not as fast as the Gyr or Gyr hybrids.

The Peregrine x Prairie as a first-year bird is coloured almost indistinguishably from an immature Peregrine. The adult plumage is a combination of the parent species' characteristics. The full Peregrine mask is lacking, but the dark line through the eye is heavier than a Prairie's. The nape is reddish. The back is bluish after the moult, but becomes browner with weathering. The background breast colour is buffy, and the markings are darker and denser than the Prairie's but without the Peregrine's barring except for a little on the flanks. In the adult tiercels the body coloration is more Peregrine-like than in the females.

The beak is quite long and prominent and tends to grow rapidly. It splits easily and requires frequent coping. The head is broad at the back like a Prairie and narrow in front like a Peregrine, requiring different hood patterns than either parent species. The foot is large like a Peregrine's but the toes are not quite so long.

The predominance of Peregrine behaviour contributes to the usefulness of this cross for falconry purposes. They will wait on as long, high and well as Peregrines and can be brought to field excellence within their first year with enough experience. Their hunting drive appears to be stronger than a Peregrine's and they will readily attack a ground quarry, which may occasionally interrupt a promising waiting-on flight. Their appetite is greater than a Peregrine's and much greater than a Prairie's.

The flying style of the Peregrine x Prairie hybrid resembles that of the parental race of Peregrine. The Peale's x Prairie has the powerful wingbeat

and boldness of the Peale's, and the *tundrius*-Prairie hybrids have the aerial tendencies and agility of the *tundrius* race. The slow, cruising wingbeat of the Rocky Mountain *anatum* Peregrines is also seen in their hybrids with Prairies.

2) *peregrinus* x *pelegrinoides* Peregrine x Shahin). Shahin behaviour predominates and coloration is intermediate. These hybrids have the rapid, continuous wingbeat and preference for fast horizontal tailchase which characterize the Shahin. They are less prone to wait on at a great height than a Peregrine would be. The adult plumage tends toward the buffy unmarked breast of the Shahin, with a few Peregrine markings present. The Peregrine mask is usually present to an intermediate degree. Size is closer to the Peregrine than the Shahin. Some individuals are extremely broad and powerful in the chest and weigh much more than their size suggests.

3) *peregrinus* x *rusticolus* (Peregrine x Gyrfalcon). These are the most spectacular fliers of the hybrid falcons. Size is intermediate between the parent species. Gyr personality (playful, friendly, intelligent) and coloration prevail, but they will often wait on like a Peregrine, reaching great heights. They mature slowly in behaviour, as Gyrs do. The Peregrine behaviour tends to emerge with maturity and experience. The speed of flight is equal to that of a Gyr (up to 50% faster than a Peregrine) plus they have the Peregrine's agility. They are thus able to catch strong-flying pigeons, which are too manouverable for Gyrs to catch regularly. They can mount rapidly and directly like a Gyr, and have the Gyrfalcon's twisting, vertical power stoop. This hybrid is probably the best falcon for the various speedy species of western grouse (Sage, Sharptailed, and Prairie Chickens). They are resistant to aspergillosis, frounce and bumblefoot, to all of which Gyrs are very susceptible.

A *peregrinus* x *rusticolus* hybrid has been backcrossed to a Tundra Peregrine. The offspring is flying like a Peregrine even as a young bird just out of tame hack.

4) *pelegrinoides* x *rusticolus* (Shahin x Gyrfalcon). One individual, a tiercel, is relatively small, with Gyr colouration (white) predominating in the adult plumage, and a beautiful light coral hue with very faint markings in his first year. His flying style is like a Shahin, especially the tendency to go off a considerable distance before gaining pitch and coming back. He can also climb directly up on his tail to a height when in pursuit, like a Gyr. He is an extremely active and dashing flier. Although he has taken a few ducks, he clearly prefers small birds.

5) *rusticolus* x *mexicanus* (Gyrfalcon x Prairie). This cross, although almost as fast as a Gyr, presents some difficulties as a falconry bird, Gyr and Prairie programs are equally matched and since neither predominates

in most individuals, behaviour can be erratic from day to day. They can use a great variety of hunting strategies and it is difficult to make them consistently follow one style of flight. Like Gyrs they tend to choose different strategies to fit different terrains. They are prone to irascible temper outbursts when imposed upon. They have the Prairie's hardiness and resistance to disease. In most individuals the Prairie colouration predominates, but some individuals are coloured like the parental phase of Gyr.

6) *rusticolus* x *cherrug* (Gyrfalcon x Saker). These birds are extremely graceful and well formed in bodily contour, more so to this observer than either parent species. The Gyr colour, dark or light, clearly predominates. Some of the dark ones are almost completely black to an extent not seen even in dark phase Gyrs. The head form resembles that of a Saker. They are not as fast as a Gyr but much faster than a Saker. Their hunting drive appears to be remarkably strong and they will attack quite large quarry.

7) *peregrinus* x *cherrug* (Peregrine x Saker). The Peregrine colouration is dominant in the first year. Most individuals have a very long and slender body build, more so than a Saker. They wait on well like a Peregrine and learn rapidly like a Saker.

8) *peregrinus* x *biarmicus* (Peregrine x Lanner). I know of only one individual produced in France. This bird was faster than a Lanner, approaching Peregrine speed in level flight. It showed a readiness to wait on, a characteristic of both Peregrines and Lanners. The chest was heavier than that of a Lanner but lighter than a Peregrine's. Feet were much larger than a Lanner's and strongly built. Peregrine colouration predominated but some Lanner characteristics penetrated. This bird flew quite dynamically in its first year and was flown at Magpies. In its second year it lacked motivation but may have been sick.

9) *peregrinus* x *jugger* (Peregrine x Luggar). I have heard of one individual that was produced in Germany by inseminating an exceptionally strong passage Luggar with Peregrine sperm. The hybrid was said to be fast and aggressive and was flown successfully at Rooks.

10) *cherrug* x *jugger* (Saker x Luggar). Two individuals, produced in England, were trained to wait on and were flown successfully at partridge and grouse.

11) *peregrinus* x *sparverius* (Peregrine x American Kestrel). In the case of the two individuals I know of, the size is intermediate between parent species. Kestrel coloration is dominant, but the chest is heavy and the feet large, though not so much so as a Peregrine. With the long thin wings of a Kestrel and powerful pectorals of a Peregrine, these birds were surprisingly functional as fliers. One kept at hack could outfly wild starlings.

12) *rusticolus* x *columbarius* (Gyrfalcon x Merlin). The bird I knew of, twice as heavy as a female Merlin and half as heavy as a male Gyr, had

the proclivity of both parent species for fast, persistent tailchases. It was lost in its first season chasing quarry out of sight. Coloration was like that of an immature grey Gyr and the tail was quite long.

13) *peregrinus* x *columbarius* (Peregrine x Merlin). In three cases, the size is intermediate between parent species. Merlin coloration predominates. Two of these birds fly like Peregrines and wait on well, preferring stooping to tail-chasing. The third has a Merlin-like tendency to tail chase.

14) *peregrinus* x *ruficularis* (Peregrine x Bat Falcon). A colour photograph of this hybrid in first-year plumage shows the Bat Falcon colouration clearly dominant. The only apparent Peregrine colouration is the bluish-grey back, lighter than a Bat Falcon's, and curiously enough it is an adult Peregrine characteristic.

15) *peregrinus* x *deioleucus* (Peregrine x Orange-breasted Falcon). At least three examples of this cross have been produced. They are said to be very fast fliers. Most flew rather like Peregrines but one is reported to have a marked preference for tail-chasing rather than stooping.

16) {(*pelegrinoides* x *mexicanus*) x *mexicanus*} x *rusticolus* (a Shahin/Prairie hybrid crossed with a Gyrfalcon). The resultant male bird had Prairie-like colouration in his first year but now in adult plumage is coloured like a grey Gyr with a very whitish breast. He is no heavier than a large tiercel Peregrine and is elongate in build, with exceptionally long legs and tail. He is amazingly fast and agile and has a tendency to chase quarry all over the sky and landscape. He will wait on but has a tendency to dash off after distant quarry. He seems to prefer upland game to waterfowl, although he has taken several ducks.

17) (*pelegrinoides* x *mexicanus*) x *mexicanus* {(Shahin x Prairie) x Prairie}. Several of these birds, the result of backcrossing an F1 Shahin x Prairie, have been produced. The colouration is like a Prairie in the first year. In adult plumage the breast is white with a few dark streaks and teardrop markings like a Prairie, but the top of the head is reddish. These birds are not as fast as tribred 16.

18) (*pelegrinoides* x *columbarius*) x *mexicanus* {(Merlin x Shahin) x Prairie}. This bird was obtained by crossing a tiercel Shahin with a female Merlin, and then crossing the F1 with a Prairie. Merlin colouration was dominant in the first-year plumage but there may have been some Prairie penetration. It was said to be a capable flier. The build was comparatively broad and the tail was relatively shorter than a Merlin's.

19) (*rusticolus* x *peregrinus*) x *rusticolus* (a Gyr/Peregrine hybrid backcrossed to a Gyr). The single example, a tiercel, flies very much like a Gyr.

20) (*rusticolus* x *peregrinus*) x *peregrinus* (a Gyr/Peregrine hybrid

backcrossed to a Peregrine). The single example, a tiercel, flies very much like a Peregrine.

In recent years several more examples of backcrosses 19 and 20 have been produced, with flying styles consistent with those noted here.

In looking over the experience with hybrid falcons so far, I am impressed by how often the hybrids are aerodynamically very competent even if they come from parent species with markedly different sizes and wing loadings. Examples are the Peregrine x Kestrel cross, the *peregrinus* x *columbarius* cross and the Gyr x Merlin cross. This may merit further attention by geneticists.

This article first appeared in the April 1986 issue of *Hawk Chalk*, whose editor has kindly given permission to reprint and revise it. There is and will be much new information available which could be added to this brief survey. It should be emphasized that the foregoing descriptions are based on relatively few cases, and that the generalizations presented here may be modified by further data.

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THE RESPONSE OF AN AFRICAN GREY PARROT TO NEWLY-HATCHED CHICKS.

By ERIC CALLAGHAN
(Co. Dublin)

From time to time one reads reports of newly-hatched parrot chicks being killed or severely injured by the adults. The following observation may suggest a possible explanation for some such occurrences.

The birds involved are a pair of African Grey Parrots *Psittacus erithacus* both previously kept as pet birds and consequently very tame. Both birds were known to be over ten years old when first given the opportunity to breed. The pair is housed in a cage of 4' x 3' x 3' high (1.22 x 0.91 x 0.91m), with a nest box attached to the outside. After a series of infertile clutches, fertile eggs were finally produced, but the young were killed by the hen at hatching. After this had been repeated a couple of times the eggs were removed at the point of hatching, hatched in an incubator and the young reared by hand. Eventually it was decided to attempt to reintroduce newly hatched young to the female in case it was the process of hatching that caused her to kill them. Such interfer-

ence was only possible because the hen was so tame and did not resent disturbance, although the cock had to be removed first as he proved to be too aggressive. The three eggs were taken at the point of hatching and placed in an incubator as usual. In the meantime the hen was given a plaster pigeon's egg to incubate.

When the first chick to hatch was dry it was replaced in the nest while the hen was absent. The side of the nest-box was left open in order to monitor what subsequently occurred. The hen did not object to this. Upon entering the nest and discovering the chick the hen seemed to become extremely excited and immediately began to "clean" the chick all over, the action being reminiscent of a cat or dog towards newly born young. Special attention was paid to the tips of the wings and the toes, in fact some of the toes were quite extensively bruised, to the extent that one claw was later lost. The actions of the hen were fast and jerky, at times appearing quite rough, so much so that once or twice the chick was knocked from under her, at which point she continued for a moment to groom her own feet before retrieving the chick. Throughout this performance the hen kept up a continuous low crooning, growling sound which I had never heard before. These actions continued for about ten minutes, by which time the chick appeared to be getting weaker, being subjected as it was to almost constant attention. During this time the hen had made no attempt to feed the chick, so in order to give it some respite and enable it to regain strength, I removed it for a few minutes, during which time it was fed once by spoon. It says a lot for the tolerance of the hen that she allowed me to put my hand under her both to remove the chick and later to replace it. By the time the chick was returned the hen appeared to have calmed down and was more gentle towards it. As everything seemed to be going reasonably well the nest-box was closed and the cock was readmitted. The following day as the chick was still alive, the two other chicks that had hatched in the meantime were added to the nest. All three young were reared without any problems.

I decided to leave the eggs of the next clutch to hatch under the hen, but to keep a close watch on events. When the first chick pipped the shell and began to call, the hen chewed it out of the egg, apparently being too stimulated. This action, of course, resulted in the death of the chick. The other two chicks were hatched in the incubator and returned to the nest, being subsequently reared without any problem. Since then the pair has gone on to hatch and rear a number of broods quite normally. It would appear that the death of the early chicks was the unfortunate result of too much attention from the inexperienced hen, the chicks dying of exhaustion if they managed to hatch in the first place, and subsequent chewing of the dead chicks being a normal means of cleaning up the nest cavity.

Evidence that this response to newly-hatched young may be widespread among psittacines was obtained from observation of a hen Splendid Parrakeet

Neophema splendida which had laid in the corner of a flight cage. The first chick to hatch had pipped the shell but had been unable to proceed further due to the drying of the membrane. The egg was opened manually and the chick returned to the nest, whereupon the hen responded towards it in exactly the same way as had the African Grey. This particular hen was an experienced breeder and so the chick was reared successfully, but it is encouraging to learn from the above case that a bird which has a history of destroying young may eventually come to rear her young successfully.

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FURTHER NOTES ON MAN/BIRD RELATIONS IN CHINA

by JEFFERY BOSWALL

(Bristol)

During fourteen days in China, 15th-28th February 1988, I gained some additional knowledge on this topic.

Bird Markets

The bird market at Guan Yuan in Beijing (Peking) was a major disappointment on New Year's Day and the day after since both sellers and customers were more involved in seeing in the Year of the Dragon than in feathered trading. However on 17th February (the second day) one seller had ten or a dozen Hwameis (Brown Laughing Thrushes) *Garrulax canorus* for sale, and two men each carried a Marsh Tit *Parus palustris* in a cage. The next afternoon the tally was as follows.

The exotics were sixty Budgerigars *Melopsittacus undulatus*. The birds of species indigenous to China were: twenty-four Hwameis (Brown Laughing Thrushes), four Mongolian Larks *Melanocorypha mongolica*, five Eurasian Siskins *Carduelis spinus*, three Bramblings *Fringilla montifringilla*, two *Parus* sp. (not *palustris*) and one each of Little Bunting *Emberiza pusilla*, Meadow Bunting *Emberiza cioides*, Chestnut Bunting *E. rutila*, Red-billed Leiothrix (Peking Robin) *Leiothrix lutea*, Grey-capped (Oriental) Greenfinch *Carduelis sinica* and Chestnut-flanked White-eye *Zosterops erythropleura*.

The tally at three or four bird shops in the general free market near the Confucius Temple in Nanjing on 22nd February was: Exotic species: Canary *Serinus canaria* numerous, 114 Budgerigars; Indigenous species: two Grey-

capped (Oriental) Greenfinches, three Lord Derby's Parakeet *Psittacula der-biana*, six Crested Mynas *Acridotheres grandis*, 13 Red-billed Leiothrix (Pekin Robins), 58 Mongolian Larks and 215 Hwamei (Brown Laughing Thrushes).

If we compare Nanjing with earlier censuses in Beijing and Chengdu (Boswall, 1986), we find that the Hwamei (Brown Laughing Thrush) is in all five cities the most popular songster with the Mongolian Lark second.

Cormorant Fishing

I saw six different (Great) Cormorant *Phalacrocorax carbo* fishermen on the Gang river near Jiujiang, Shanxi province, between 24th and 26th February. All had between five and seven birds, some of them partial albinos.

Pigeon rearing

As previously observed in Harbin, Beijing, Chengdu and one or two smaller Chinese cities, the most noticeable birds in X'ion, Nanjing (Nanking) and Nanchang were pigeons *Columba livia*. These birds apparently all belong to lofts. Not once did I see any pigeons in town squares or parks, on roadside verges or traffic islands. The feral pigeon of Trafalgar Square and St. Mark's Square is absent. Why I wonder?

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REVIEWS

AVICULTURE IN AUSTRALIA

In recent years there has been a proliferation of avicultural titles - but it is rarely that a reviewer can praise every aspect of a book: content, presentation, illustrations and author's style and knowledge. What a joy, therefore, to be presented with an advance copy of *Aviculture in Australia* and to unhesitatingly place it in this category.

This is the first title from Black Cockatoo Press, a company owned by the Australian Andrew Isles, whose bookshop in Melbourne surely carries the world's largest stock of avicultural titles. The author is Mark Shephard, a young biochemist but an experienced aviculturist. He has covered, in 380 pages, all the native species in Australian aviculture, as well as the best known exotic ones. His coverage is extraordinarily thorough, summarising all the relevant information on each species under the headings of Other Names, Distribution and Habitat, Sub-species, Status in Aviculture, General Avicultural Notes, Mutations and Colour Variations.

I know of no other avicultural book which has been so thoroughly referenced. Dozens of references to relevant avicultural literature are given at the conclusion of each chapter. There are 253 references for the chapter on Australian Parrots

Chapters cover: Nutrition, Management, Parrots, Lorikeets, Cockatoos, Finches, Quail, Softbills, Pigeons, Foreign Parrots, Foreign Finches, Pheasants and Waterfowl, Basic Avian Genetics, Common Diseases and, finally, The Practical Value of Aviculture.

This book can be readily understood by someone with no knowledge of aviculture yet because of its wealth of detail and comprehensiveness, it is of equal interest to the experienced aviculturist - a style that few authors can achieve.

It has numerous uncomplicated tables and line drawings and the colour photographs are of quite exceptional quality. *Aviculture in Australia* must be considered the definitive work on the subject to date. It costs A\$50. In due course it will be obtainable from avicultural booksellers in the UK and elsewhere. At present it can be obtained only from Andrew Isles Bookshops, P.O.Box 358, Prahran 3188, Australia. There will be a small additional charge for surface postage or substantially more for airmail.

AUSTRALIAN COCKATOOS

By Stan Sindel and Robert Lynn. Published by Singil Press Pty Ltd, P.O. Box 9, Austral, NSW 2171, Australia, or from Andrew Isles Bookshop, P.O. Box 358, Prahran 3181, Australia. Price A\$ 49.95 plus postage. ISBN 0 9587727 1 1.

It would be difficult to find two people better qualified to write on Australian cockatoos. Stan Sindel is an internationally recognised aviculturist and author of the first book in this series, *Australian Lorikeets*. Sadly, Robert Lynn, perhaps the leading authority on black cockatoos in aviculture, died before this book was published. We are fortunate to have the benefit of his knowledge and experience - and there could be no more fitting tribute to his memory.

Although the book is co-authored, it is written in the first person the senior author being Stan Sindel. Stan's irrepressible personality shines through the pages, so that sometimes it is like listening to him talk. His style is immensely readable.

The book commences with a practical chapter on Housing. I would emphasise the word *practical* as it is the hallmark of the book. Of suspended aviaries Stan writes: "My observations suggest that cockatoos housed in this system do not feel as secure as when housed in secluded conventional aviaries." I agree. Most cockatoos are much too nervous to do well in this type of environment, unlike many Amazons, for example.

In the chapter on Diet there is information on the preferences of the various species, including the native foods of the Black Cockatoos. Hand-rearing foods are also described. Management, including handrearing, is covered in the next chapter, followed by Diseases by James Gill (seven pages). This includes a page on the importance of quarantine, which breeders of all species would do well to read carefully.

The following pages, nearly 200 (of the total of 252), are devoted to accounts of the species. Each one is treated under the headings of Classification, Range, Habitat and Field Notes, Diet in the wild, Breeding in the wild, Sexing, Display, Nests, Nesting and hatching and Mutations (his interest in the latter is well known). The field notes are extensive: Stan Sindel has spent hours in the field. Australians are fortunate in being able to study in the wild many of the species they keep in their aviaries. It gives them a far greater understanding of their birds than Europeans can hope to achieve.

I was extremely impressed by this book - by the authors' love of their subjects, their deep knowledge and Stan Sindel's thoroughness in delving into past avicultural literature to present a complete picture of Australian Cockatoos.

Talking of pictures, there are 40 pages of colour, 121 colour photographs, outstanding for their quality or interest. Some very pleasing uncluttered portraits by Cyril Laubscher grace the pages and, equally appealing to me, were smaller photographs, four to six for each species, showing the development of chicks. Identification of subspecies, as in the Roseate, for example, is made easy with the help of photographs.

This book is an avicultural classic - a model for other authors to follow. If you are interested in Cockatoos, it is an essential addition to your library.

R.L.

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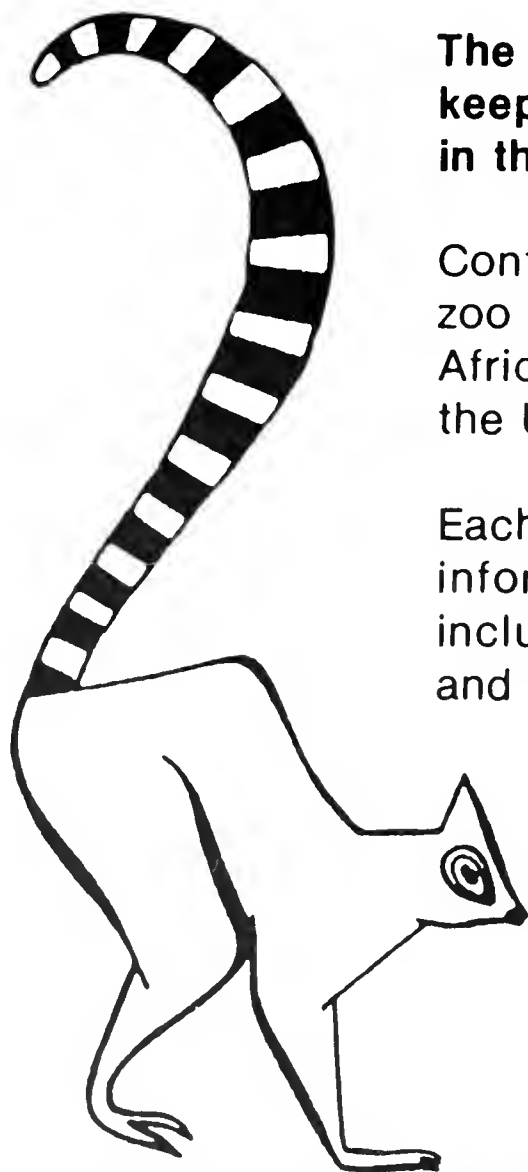
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1990

BREEDING THE AFRICAN GREY HORNBILL *Tockus nasutus epirhinus* AT CHESTER ZOO

By Roger Wilkinson (Curator of Birds)
and Wayne McLeod (Senior Keeper)

The African Grey Hornbill *Tockus nasutus* occurs in Africa and South West Arabia. In sub-saharan Africa it ranges north of the equator from Senegal to Eritrea and over much of southern Africa excepting the extreme south. Sometimes referred to as simply the Grey Hornbill this species should not be confused with the Common Grey Hornbill *Tockus birostris* of India.

Mainly grey and brown with paler underparts, the sexes of the African Grey Hornbill differ in the colour of the bill. The male's bill is mainly black with a small casque on the top and a white patch at the base of the upper mandible, whereas in the female the casque ridge is less pronounced and the upper bill dark red at the tip and yellow at the base. Of three subspecies listed by White (1965) as occurring in Africa (a fourth is described from South West Arabia), only two are currently recognised (Fry, Keith and Urban, 1988). The nominate *Tockus nasutus nasutus* is found in Africa north of the equator, whilst the smaller *Tockus nasutus epirhinus* occupies southern Africa. The latter is distinguished in that the males have a pointed tip to the black casque. The females are less easy to distinguish but in the southerly subspecies the ridges at the base of the lower mandible are described as being less pronounced (Fry, Keith and Urban, 1988; Mackworth-Praed & Grant, 1957).

Chester Zoo obtained one male and two female African Grey Hornbills in March 1985. This trio had been recently imported from Botswana and belongs to the southern subspecies *Tockus nasutus epirhinus*. From arrival all three birds were held together in one of the upper aviaries in the Tropical House being moved to their present breeding aviary in December 1986. This large aviary measures 12.0 x 2.6 x 3.5 metres high and is planted with a selection of tropical plants including *Monstera*, *Ficus*, and

Hibiscus, and during the last four years has at different times housed, in addition to the Hornbills, pairs of Little Black Bustard *Afrotis atricapilla*, Roulroul Partridge *Rollulus roulroul*, Golden Heart Pigeon *Gallicolumba rufigula* later replaced by Luzon Bleeding Heart Pigeon *Gallicolumba luzonica* and Royal Starling *Cosmopsarus regius*.

No problems were encountered with these groupings until 1990 when the African Grey Hornbills disrupted the breeding attempts of the Royal Starlings. Our Hornbills are fed a diet that includes soaked Zoo Food A chopped fruit, usually apple, pear, tomato and grapes, sprinkled with commercial insectile food and SA37 vitamin supplement. Live food in the form of mealworms and locusts, and freshly killed pink mice or rats are offered daily and proved important food items during the breeding cycle.

Display was frequent from all three Hornbills; all were observed to display by calling with the bill pointed skywards whilst rocking backwards and forwards, simultaneously extending and closing their wings. The male favoured the company of one of the two females and although no threat displays or aggressive behaviour was observed we decided it prudent to rehouse the second female in one of the lower aviaries in March 1988. Although out of sight of the pair, the single female continued to call and display.

The Hornbills accepted a parakeet-type wooden nesting box fitted vertically on the back wall of their aviary. This box measured 30 cm square x 60 cm deep and had an entrance hole of 9 cm diameter near the top of the front face. The box was filled with peat to a depth of about 30 cm. Interest in the nest-box was first shown in April 1988 when the male began feeding the female and would then fly up to the box with, for example, a locust in his bill and try to entice her into the nest. Mudding up of the nest entrance with soil and peat began on 16th April and by 1st May the female was completely sealed inside the box, only a slit of 1.5 - 2.0 cm remaining through which the female was fed by its attentive mate.

An increased frequency of feeding of the female by the male noted on 31st May was taken to indicate that a chick or chicks were now being fed. The male then carried fruit and especially live food including mealworms, locusts and pink mice to the nest. Food items were carried singly and nest visits were then necessarily very frequent. So keen to feed the female was he that he would take locusts from the hand. The female broke out of the nest on 27th June and the entrance was then mudded up again before being again broken for the emergence of the first fledgling on 13th July. A second chick fledged on the 14th and a third on 15th July. The third chick appeared weaker than the others and was removed for hand-feeding but died on 17th July from what was suspected to have been a *Candida* infection. The fourth chick emerged on 18th July but was killed by a rat

that had gained temporary access to the aviary. After breaking out of the nest the female assisted the male in feeding the chicks in the box and both parents fed the chicks for a short period after they fledged. The chicks were first seen feeding themselves on 24th July. The two surviving chicks were left with their parents and by December 1988 the reddening of the tips of the young birds' bills indicated that both were females. They were removed and rehoused with the single adult female before the adult pair showed signs of re-nesting in Spring 1989.

Inspection of the nest contents indicated not only that the female had moulted at least her wing and tail feathers but also that the parent birds had carried bark stripped off a beech log into the nest-box. No nest sanitation in terms of removal of faecal sacs was noted and presumably this provision of fresh bark assisted with nest hygiene.

The 1989 breeding attempt was initiated in April with the female being completely mudded in by the 25th of that month. Increased feeding activity by the male indicated at least one chick had hatched by 27th May. Following a very hot spell of weather we noticed that the female was not seen at the nest-box entrance from 27th June. Although the young birds were seen taking food at the nest-hole from the male our concern increased that the female might have died and so on 3rd July we took down the nest-box and removed the top panel to find the dead female together with three rather dishevelled but living chicks. Because of our concern that the oppressive heat may have caused the female's death the nest-box was relocated, after it had been thoroughly cleaned and re-filled with fresh peat, at a point about a metre lower in the aviary. The male soon began to fly to the newly positioned box with food in his bill but it took a long hour before the chicks were sufficiently confident to reach up to the nest slit to accept this food. The first chick fledged on 13th July and the two remaining nestlings were then observed re-mudding the nest entrance. On 19th July the second chick fledged but it was not until the 28th that the final chick emerged. The rearing of these three chicks was completed by the male alone and all survived to maturity as two females and one male.

These three young birds were re-housed with the two 1988 bred birds in winter 1989/90 and the single adult female then moved into the enclosure with the bereaved male. Two successive nesting attempts were made by this new pair in spring/summer of 1990 but neither resulted in fledged chicks. The male was seen feeding the female in early March but the positioning of the nest-box appeared unacceptable to them. We moved the nest-box to a new site and from 4th April the female was seen staying inside the box for long periods and by the 16th had mudded herself in from inside the box. Noises heard from the box on 21st May and the increased frequency of feeding by the male suggested that chicks had

hatched. However, the female emerged without fledglings on 21st June. The nest-box was cleaned out and re-peated and to our surprise on 11th July, just over a fortnight since she emerged from her first failed breeding attempt, the female had again mudded herself in the nest-box. Sadly this attempt also failed with no young reared to independence in 1990.

Inspection of the nest-box after both failed attempts in 1990 revealed neither dead chicks nor eggs but indicated that on both occasions the female had moulted her wing and tail feathers whilst inside the box. The link between incarceration and moult must be particularly strong for the female to have undergone two moults in such a short time period.

The *International Zoo Yearbooks* report breeding of the African Grey Hornbill at Walsrode, West Germany, and at Pittsburgh Aviary, Pennsylvania, U.S.A., in 1982. Since that date breedings of this species have also been reported from Cape Town World of Birds, South Africa, and the Cincinnati Zoo, U.S.A. We can find no previous records of the breeding of the African Grey Hornbill in the United Kingdom and believe this may be the first. We would be delighted to hear of anyone else holding this subspecies of the African Grey Hornbill so that our young birds may be correctly paired.

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As described, Chester Zoo has bred the African Grey Hornbill *Tockus nasutus epirhinus* in 1988 and 1989 and this is believed to be the first success in the country. Anyone knowing of a previous breeding in Britain or Northern Ireland, or of any other reason to disqualify this claim, is asked to contact the Honorary Secretary.

* * *

BREEDING GOFFIN'S COCKATOO, 1974 - 1989

Cacatua goffini

By E.G.B. Schulte
(Eindhoven, Holland)

I have bred Goffin's Cockatoo since 1974 and wrote about it in this Magazine in 1975.

Breeding pair 1

This pair was purchased in 1974. They were shy, imported birds and placed in a small box cage indoors.

Breeding results were inconstant throughout the years. Sometimes I had to hand-feed a chick, when the parents did not feed it properly. The following table gives a summary of the breeding results.

Pair 1	<u>Number of young</u>		<u>Details</u>
	Hatched	Fledged	
1974	1	0	Young died shortly before fledging.
	2	2	
1975	2	1	1 young undernourished when 1 month old. Hand-feeding failed.
1976	2	2	
1977	2	2	1 young undernourished when 7 weeks old. Hand-fed.
1978	1	0	Young dead shortly after hatching.
1979	0	0	Clear eggs.
1980	2	0	1 young undernourished when 5 weeks old. Hand-feeding failed.
1981	2	0	Both died shortly after hatching.
1982	2	2	Both hand-fed from the age of 1 week.
1983	1	0	Young died shortly after hatching.
1984	0	0	Eggs failed to hatch.
1985	1	1	
1986	1	1	
1987	2	2	
1988	2	2	
	2	2	2 successful nestings for the first time.
1989	2	2	

The incubation period was four weeks. The young spent 9-10 weeks in the nest. They were taken away from the parents three weeks after fledging. The average weight of the males at that time was 240 gr and of the females 220 gr. The average weight of all birds older than a year was 310 gr and 260 gr (males and females).

Housing

The following cages were used:

	<u>Type</u>	<u>Measures</u>
1974 - 1979	small box cage indoors	87 x 44 x 70 cm high
1980 - 1981	outside aviary	300 x 100 x 200 cm high
1982 - 1983	inside aviary	200 x 100 x 200 cm high
1984 - 1989	large box cage indoors	200 x 50 x 70 cm high

The nest-box measures 25 x 25 x 40 cm high. The best breeding results were obtained in recent years. I think that using a box cage plays an important role as shy birds feel more secure in a sheltered cage. However, compatibility of the pair is necessary, as the female cannot escape from an aggressive male.

Feeding

Little has changed since 1974. The birds eat sunflower, canary, hemp, rice, soaked maize and peas, moist bread sprinkled with a vitamin-mineral powder, greenfood and since 1989 a pellet for parrots.

Breeding attempts by the young

Over the years four young were paired to imported partners. They could not choose their partner.

A young male from 1974 was paired to an imported female in 1975. They had a chick in 1978, but it was thrown out of the nest shortly after hatching. There were no more breeding attempts and the female was found dead in the nest-box two years later.

The home-bred female of 1975 was placed together with an imported male in 1980. She started to feather-pluck two months later. Sometimes she injured her skin and she died in 1984, her breast covered with blood. There were no breeding attempts.

A young male from 1976 was paired to an imported female in 1978. They had broken eggs in 1983, 1984 and 1985. The pair was sold in 1986.

The homebred female of 1980 was put together with an imported male in 1981. She has plucked her feathers since 1985 and sometimes she bleeds from her breast. There have been no breeding attempts.

Feather plucking

This is especially a problem with the females. The young of 1976 were a male and a female. When an imported female was placed in their outside aviary in 1978, the young female started to feather pluck.

The young of 1977 were two females. They were sold and placed together in a large cage. I heard from the new owner that they plucked their breast feathers some years later.

A hand-fed young male of 1982 bit his flight- and tail-feathers off shortly after he was sold at the age of four months. He repeated this almost every year.

In 1984 someone gave me an imported female. She had plucked her feathers since her partner escaped. I placed her in an inside aviary together with an imported male (pair 2). She also plucked the male.

Breeding pair 2

In 1985 there were only eggs. After that I placed them in a large box-cage indoors. In 1986 they had two young. These were badly plucked. When they climbed out of the nest, they had only down. Their body- and tail-feathers soon reappeared, but they still cannot fly. In 1987 Pair 2 had one young. It again was plucked, but some flight feathers were left and he could fly short distances. In 1988 there were no young. In 1989 one young hatched. When the young of Pair 1 were taken away from the parents three weeks after fledging, the young of Pair 2 was 16 days old. I placed him in the nest-box of Pair 1. He was accepted and reared without problems. The young of both pairs already have red lores in the nest, just as the adults.

Conclusions

Two major problems were experienced while breeding Goffin's Cockatoo: the lack of success in rearing a second generation and feather-plucking. The causes of the first problem are probably the pairing of home-bred to imported birds and the forced pair formation. Feather-plucking is a connected problem, caused by stress and sexual frustration. I have taken the following measures to solve the problems: I do not form mixed pairs of home-bred and imported birds any more and I keep the young in a group until they are sexually mature and have formed compatible pairs spontaneously. I observe the group by video camera and try to avoid stressful situations especially for the females.

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**SUCCESSFUL BREEDING OF THE RUFOUS-HEADED
CHACHALACA *Ortalis érythroptera*
(SCLATER AND SALVIN, 1870)**

IN THE ORNITHOLOGICAL ZOO AT SCHMIDING, AUSTRIA

By Andreas Artmann

The genus *Chachalaca* includes 10 to 12 species. It is ontogenetically the most primitive within the family of the Cracidae.

The inconspicuous and lustreless plumage which is the same for both sexes, the absence of a beak wattle, as well as a crest which can be raised by means of the crown feather, are characteristics of this genus.

A further special feature of the Chachalacas is their habitat in Central and South America. While the other Cracidae live predominantly in the forest, the Chachalacas live in the man-created secondary bush zone. These birds are thus one of the few living beings which profit from man's destruction of the forest in Latin America.

Because of their inconspicuous appearance, the Chachalacas were hardly ever imported and only rarely kept in zoos and in the case of the Rufous-headed Chachalaca there has been, so far, no published record of their being kept in captivity.

For the definition of the various species, their geographical distribution, which hardly ever overlaps, is used. Thus the Rufous-headed Chachalaca is the only Chachalaca species which is found in Western Ecuador and Northwest Peru. Further peculiarities of these Chachalacas are the reddish-brown head and neck feathers, the blue-greyish orbital region as well as the chestnut-brown tail feathers. Its breast feathers are chestnut-brown but are of a lighter brown down to the belly and are then of a greyish yellow. The back and the wings are brown.

Care

In the Ornithological Zoo at Schmiding the breeding pair of Rufous-headed Chachalacas is kept in a roofed, open-air flight (about 50 sq. metres, 4.4 metres high) with an adjoining indoor room. The open-air flight, which contains tree trunks, various tree branches and stones, includes an area of dense growth as well as an open, sandy area. The diet of the Chachalacas consists of a mixed feed of finely grated heart of beef, grated carrots, eggs and mealy, prepacked chicken feed. Finely-cut fruit, especially bananas and coarsely grated apples, shredded lettuce and baby food are also used. An additional source of animal protein are mealworms which are fed at intervals of a few days.

The specifically typical calls and sounds which led to the name of Chachalacas we could seldom hear from our birds, but very loud and penetrating screeches when the birds were scared or angry, were heard. Although the Chachalacas know their keeper very well and are capable of distinguishing him from other humans they nevertheless always prefer to keep a certain distance between themselves and any humans.

Breeding

In May 1989 the breeding pair of Chachalacas was given a nesting site in the indoor room in the shape of an artificially pre-formed nest of dried grasses which the birds readily accepted. Already by the 27th of the same month two white eggs were found in the nest. One day later the third egg was laid. This set of eggs was removed and put in an incubator on 1st June.

On 29th June, that is after an incubating period of 28 days, at a temperature of 36.8° Celsius, two Chachalaca chicks hatched. The third egg was infertile. The weight at hatching was 40 g and 38 g respectively. Because of the well-developed down, the Chachalaca chicks appear rotund. In proportion to the body, the head is rather large, the pink legs are comparatively short. The colouring of the head, back, wings and the tail is of an uneven rust-brown, chestnut-brown to dark brown and black. The down changes in colour from the rust-brown breast onwards to the belly, getting lighter until it is completely white as is the case with fully grown mature birds. The underside of the beak (chin and throat) is white, the point of the beak is black. The base of the upper part of the beak is pink. The dark brown eyes are surrounded by a soft white-blue orbital region.

On the first day of their lives the young birds were put into a rearing box (100 x 50 x 50 cm). The floor of the box was sanded, and feed and water containers were placed on rough kitchen paper which was changed daily. One side of the rearing box was heated by an infra-red radiator. During their first days, the young birds were fed the above described feed, finely grated apples with baby food as well as freshly skinned and decapitated mealworms. In order to ensure a sufficient supply of vitamins and minerals, starting the second day the feed was given an addition of a multi-vitamin and mineral composite as available in the trade. At the beginning, the young birds were given the feed by means of tweezers but they soon learnt to feed by themselves and, after three days, feeding by tweezers was discontinued.

Now the rearing box was altered. Small branches and roots enabled the Chachalaca chicks to try out their wings and provided ample and diverse means of exercise.

Starting on the seventh day, one of the young birds showed signs of lessening activity as well as slower body and weight growth and died on

the 12th day. The autopsy showed an unspecified enteritis.

From the second week, finely cut lettuce or dandelion leaves were fed in addition to the original feed. At the age of about three weeks the young Chachalaca was resettled in a larger, indoor flight, together with two young Amazon Razor-billed Curassows *Crax mitu tuberosa*. He was now completely self-sufficient, could fly very well and got on excellently with the other young birds.

In the meantime it was mid-June and the first set of second breeding eggs had been laid although not brooded and were found to be infertile. On 27th July a check of the nest found a second set of three eggs. This time the female bird sat on the eggs and on 18th August, that is after at least 26 days of brooding, three Chachalaca chicks hatched. A few hours after hatching the young birds left the nest and followed the Chachalaca hen.

It is very important to provide branches so that the young birds, which during their first days of life are unable to fly, can get back to their nest. Otherwise the parent birds fly up to their roost and spend the night apart from their young. The young would cower on the ground and could easily catch cold. This situation when the young, during their first days of life, spend the night apart from their parents, has also been observed in nature with other Chachalacas.

During the first days after hatching the Chachalaca family was kept in the protected indoor room because this facilitated a more exact observance of the well-being of the young birds. Although the temperature of the indoor room was constant, the young birds were able to warm themselves below an infra-red radiator.

The composition of the feed was in all essentials adhered to, although the Chachalaca chicks were given a feed which was more finely cut up. During the first days of life, mealworms were only fed shortly after they had been skinned and beheaded. As with feeding by hand a vitamin and mineral composite was added. At first the parent birds offered the feed to their young by holding it in their beaks from which the young birds avidly picked it off. The young Chachalacas quickly learnt to feed by themselves but still liked to be offered food by their parents when a few weeks old. Although Rufous-headed Chachalacas could manage without the help of their parents at only a few days old the development of these typically precocious birds is relatively slow. The young birds only reached their full size at six months and were then settled in another flight. The breeding pair of Chachalacas was offered a new nesting site whereupon the birds immediately started breeding.

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The chart shows the steady increase in body weight of the Rufous-headed Chachalaca young. The difference in weight between males and females is already observable during the first few weeks of life.

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HUSBANDRY AND PROPAGATION OF THE BLACK- NAPED FRUIT DOVE, *Ptilinopus melanospila*, AT THE ST. LOUIS ZOO, U.S.A.

By Bruce W. Bohmke
(Curator of Birds)

Black-naped Fruit Doves have been exhibited at the St. Louis Zoo since December 1986, when two wild-caught pairs were purchased from a dealer. Nineteen offspring have been produced to date, 15 of which were reared to fledging. This article summarises husbandry methods and data collected from reproductive efforts.

On arrival the pairs were housed separately in planted exhibits in the Zoo's Tropical Bird House. The display in which breeding first occurred has an area of 20.8 square metres and is 3.7 m high. Public viewing is on one side only and is through a barrier of piano or harp wire with a 2.5 cm separation between wires. Vines and branches are mixed with commonly available house plants, (*Ficus*, *Aglaonema*, *Bracaena*, *Philodendron*, and *Schefflera*) to provide a natural setting. The substrate is soil covered with oak bark chips. Skylights illuminate the display and some supplemental overhead lighting is provided for 12 hours a day.

The birds are fed once daily between 8:00 and 9:00 am on a feeding platform elevated 1.2 m above the floor. Food consists of a mixture of diced fresh fruits and cooked, canned, and diced vegetables. The produce is mixed with a small amount of Soft-Billed Bird Fare made by Reliable Protein Products. A second feeding is added in the late afternoon when a chick is being fed.

A small, gradually sloping concrete pool provides both drinking and bathing water. The exhibit is serviced once daily between 1:00 and 3:00 pm. Artificial nest-baskets, measuring 20 cm in diameter and 8 cm in depth, were placed at varying heights in some of the larger plants. A pair of Luzon Bleeding Heart Doves *Gallicolumba luzonica* was also maintained in this display.

A single pair of Black-naped Fruit Doves was placed in the enclosure on 5th January 1987, following a one-month quarantine period. The first egg was laid on 7th February in a nest-basket. The nest was wired in a tree fork at a height of 2 m. No nest material was added to the nest by the birds. Incubation was by both sexes, but the female was always seen on the egg early and late in the day and seemed to perform the majority of incubation. The male was never seen on the egg longer than three hours in any one period. The male would frequently perch within a quarter metre of the nest when the female was incubating.

The egg pipped on 26th February after a 20-day incubation. The following day the male was observed regurgitating to the chick. Both sexes were seen feeding the chick. The chick left the nest on the twelfth day after hatching, and flight was observed the next day. The body size of fledgling is less than half that of the adult, with the exception of the rather fully developed wings. The adult birds would regularly sit next to the chick and would occasionally drape one wing over the chick. The chick never descended to the ground unless forced to do so by some action of the keeper.

The first chick was a male which was confirmed by observation of grey feathers coming in between the base of the bill and the eye. These feathers first appear around four to five weeks, as mentioned by Goodwin in *Geons and Doves of the World*. Young males have never been known to moult later than at eight weeks old, although the first grey feathers may be difficult to detect. This first chick was removed from the parents' enclosure at 39 days, the same day the second egg was laid. At this age the chick had been seen self-feeding and it experienced no difficulty feeding after being separated from the adults.

This pair of Fruit Doves and a second breeding pair have been housed at several different locations during the last three years. In addition to the previously described exhibit in the Tropical Bird House, birds were housed in a similar but smaller display. The second display was only 10.5 square metres, but the same height (3.7m). The nest basket in this exhibit was placed at a height of 1.5 m. Fruit Doves also bred in an off-exhibit area in the basement of the bird house. The cages were constructed of wood frames and 2.54 x 2.54 cm galvanized welded wire. The enclosure measured 2.4 x 1.9 m, and was 1.8 m in height. The food and water dishes were on a platform 1.5 m off the floor. The substrate was concrete covered with wood shavings. Visual barriers were provided by hanging opaque plastic sheets from the top of the cages.

Black-naped Fruit Doves are prolific breeders and will lay sequential clutches with little or no pause between rearing offspring and laying the next egg. The female has often produced the next clutch while the male is feeding the recently fledged offspring. Our most successful pair reared six offspring one year, six the next year, and four the following year. Forty-one clutches from three different pairs were one-egg clutches.

The most successful reproduction occurred in the largest and most heavily planted exhibit. The smaller the enclosure and the less privacy the birds had, the more frequently eggs were broken or laid in inappropriate places, such as on the ground. Once a pair had established a record of successful breeding, however, they could be moved to less spacious surroundings and breeding would continue.

Observed incubation periods varied between 18 to 26 days. The average of 17 incubation periods was 21.5 days. Incubation of the egg is nearly constant and the female contributes the majority of the effort. Both parents were seen to feed the chick. Hatching weights for seven chicks ranged from 5.3 grams to 6.7 grams with a mean hatch weight 6.1 grams. The period of time before the chick left the nest varied from 8 to 14 days. The mean of 12 fledging periods was 11.7 days. The average of three fledgling weights was 26 grams and the average weight of the same three birds when separated from their parents was 84 grams. Average adult weights of eight males and seven females were 109 and 101 grams respectively.

Black-naped Fruit Doves are hardy and prolific if set up properly. Aviculturists should make every effort to establish this easily managed bird as a captive population. So many species are imported and breed well but after a few years of neglect decline to the point where they are lost from captivity unless additional birds are acquired. The North American regional studbook, recently established at the North Carolina Zoo and administered by Curator of Birds, Ron Morris, should help to secure the future of this attractive Fruit Dove in captivity.

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KEEPING AND BREEDING THE BLACK-CROWNED WAXBILL *Estrilda nonnula*

By R Wallis
(Bristol)

The delightful Black-crowned, or Black-capped Waxbill, as it is otherwise called is little known to British aviculturists as it is imported very infrequently and then only in small numbers.

It is distributed across tropical central Africa, from Nigeria and Cameroons right through to extreme south-western Sudan, Uganda and Kenya.

Within this area it is often to be found in small flocks around forest clearings and on mountain slopes and at altitudes up to 2,500 metres (higher than any other waxbill) where temperatures are often only about 5°C.

The sexes of this beautiful and delicately coloured bird, as far as I can tell, are identical in physical appearance. Briefly the markings are as follows:- forehead, crown and nape - black; rump and flanks - pink to crimson; back - grey diffused to white with a subtle barring effect noticeable on close inspection; breast - white to grey.

Although rarely available a few small consignments of these birds have been available over the past few years and it was in late February 1988 that I purchased four of these enchanting waxbills from an importer.

Once safely home and introduced to a large flight cage in the bird room, they were initially allowed a temperature of 15°C before this was gradually and I stress gradually, reduced to the normal temperature of the bird room over the next couple of months.

I made a point of only heating one end of the flight cage so that each individual bird was allowed to choose the part of the cage which it found most comfortable. The heat was provided by using a 300 mm tubular heater wired through a thermostat. By early May the heater was switched off in preparation for the change to summer quarters. This consisted of an unheated inside flight from where they were to be fed.

In mid-May three of these birds were given access to a large outside planted flight after spending a week or so in the inside flight to become accustomed to the change in surroundings.

A nest was constructed of coconut fibre, feathers and moss approx. 1.5 m from the ground. It was a typical waxbill's nest with a tunnel and a "cock's nest" above the main nesting chamber. The downward pointing tunnel entrance faced in a westerly direction, as did those of subsequent nests.

On the morning of 9th June, I checked carefully the eggs which appeared to be fertile. Once this was ascertained the nest was left well alone as the adults seemed very nervous and at the slightest hint of danger they would leave the nest, but would retire quickly once the 'danger' had passed.

Two chicks hatched, possibly on 20th June, and by 13th July these had fledged but returned to the nest shortly after fledging.

The following day, on finding no chicks flying about, I checked the nest with trepidation only to be delighted with a finger count of three.

The chicks were soon fully fledged and gaining strength and size. Upon leaving the nest the chicks were very much like their parents although they lacked the red and were generally a little duller particularly on the breast.

By 23rd July a second nest was being constructed, again 1.5 m from the ground and facing in a westerly direction. This time though, the efforts put into building a "cock's nest" were directed towards the first nest which was subsequently enlarged, leaving the second nest free from any such attention.

On 28th July, the first egg of the second round was laid and by 1st August the nest had received a full clutch of four white eggs. Three of the eggs had hatched by 17th August, followed a day later by the fourth egg.

All four of the chicks successfully fledged together on 8th September.

So despite my numerous intrusions to check the progress within the nesting chamber, all seven chicks were successfully hatched, reared and fledged to maturity.

I believe that a contributing factor to the intrusions being accepted by the parent birds and indeed to the inducement of the bird to nest, is the size of the flight, this being 3.5 m x 4.0 m x 2.2 m high. I am of the opinion that the height in particular is of great importance in the encouragement of all my birds to produce positive breeding results.

The foods offered prior to the birds being released into the aviary were panicum millet, millet spray, mixed millets, soaked seed sprinkled with Orlux eggfood and an insectivorous food. I also offered a wild seed mix which was picked over for small seeds.

Once the birds were released into the outside flight livefood was introduced in the form of aphids, ants and pupae; also a large pile of grass cuttings generated a considerable number of insects.

Once nesting had started the collection of aphids began, gradually increasing the supply from once to three or four times daily. These were collected from nettle beds, taking great care not to damage the nettles so as to maintain the source. Aphids from pear trees, I have noticed were not taken and also blackfly were refused.

The adults and independent young spend a lot of time flitting from bush

to bush in a tit-like fashion, I assume looking for insects and small seeds.

Bathing facilities are offered daily and used regularly throughout the day.

All the offspring have been left with the parents and allowed to fly and live as a small flock.

From talks with friends who are also trying to breed these birds, I understand that they have lost individuals due to *Candida* and liver failure, which may suggest a dietary problem. The diet apart, I would conclude that these lively members of the estrildid family will survive and reproduce in a large planted aviary with a plentiful and varied supply of small insects throughout the summer months.

Provided they are not overcrowded and are carefully acclimatised they should prove, once established, to be hardy. Indeed with due care and consideration to the position and exposure of their flight, I have successfully overwintered these birds in the previously mentioned accommodation without any problems.

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THE FEEDING AND BREEDING OF SOUTHERN AFRICAN BUNTINGS IN CAPTIVITY AND IN THE WILD

By Neville Brickell & Kenneth Arnold
(Avicultural Research Unit, South Africa)

The GOLDEN-BREASTED BUNTING *Emberiza flaviventris* is also known as the Red-backed Yellow Bunting and Red-backed Bunting. In the wild it has been observed feeding on seeds of weeds and grass near or on the ground. The seed of hay *Chloris virgata* has been recorded. Livefood consisted of beetles, termites, ants, grasshoppers, crickets, flies and mantids. In the aviary, they have been recorded feeding on the seeds of Teff Grass *Eragrostis tef*, Weeping Love Grass *E. curvula*, Dew Grass *E. obtusa*, Bird-seed Grass *Phalaris canariensis*, Guinea Grass *Panicum maximum*, Blue Panic *P. laevifolium* and the fruit of the Inkberry Tree *Cestrum leavigatum*. Livefood consists of small spiders, mealworms, thrips-nymphs, springtails, fishmoths, hairless caterpillars and wasp larvae or "grubs".

The Golden-breasted Bunting constructs a loosely made, shallow cup-shaped nest of roots and dry grass lined with fine rootlets and a thin layer of animal hair on top of this, placed 45-150cm up in a horizontal fork of a tree or bush. The breeding season is from October to February in Natal and the Transvaal, September to March in the eastern Cape Province, South Africa, and October to December in Zimbabwe. The two to four eggs are white, cream, bluish or greenish, spotted, scrolled and pencilled with black, sepia and ashy grey mainly at the thick end. Egg measurements average (100) 19.7 x 14.3mm (17.9-23.3 x 13.1-15.2; one 16.6). The nest cup has an external diameter of 5cm and a depth of 3.8cm. Incubation is by the female and lasts 12.5-13 days; male feeds the female at the nest; nestling period has been recorded as 16-17 days in the wild, 17 days (1) in an aviary bird.

The LARKLIKE BUNTING *Emberiza impetواني* has also been called Lark Bunting, Pale Rock Bunting and African Rock Bunting. In its natural state it feeds on seeds and insects with green hairless caterpillars and a butterfly being recorded. In captivity it takes a seed diet with hay *Chloris virgata*, Natal Redtop *Rhynchelytrum repens*, Guinea Grass *Panicum maximum*, Weeping Love Grass *Eragrostis curvula*, Buffaloquick Grass *Paspalum distichum*, Garden-setaria *Setaria pallide-fusca* and fresh cut Lucerne *Medicago sativa* having been recorded. Insects and other arthropods, namely mealworms, hairless caterpillars, thrips-nymphs, termites, fly larvae or "maggots", gnats, craneflies, spiders and millipedes are also eaten.

The Larklike Bunting builds a shallow, but neat cup composed of coarse sticks and lined with fine grass and rootlets or occasionally with thistle-down. Nests are built on the ground under, or at the base of a rock or stone, in shelter of a small shrub or rock ledge on stony ground, less often in flat, sandy ground. The nest cup has an internal diameter of 5.3-5.8-6.7cm and a depth of 2.4-2.9-3.9cm (8). This bunting breeds from September-November in western Cape Province, South Africa, March-May in Zimbabwe and April-May in Botswana. Two to four, usually three eggs are laid which are white, greenish white or bluish, spotted and blotched with red-brown and slate-grey. Egg measurements average (31) 17.5 x 13.5mm (16.0-19.6). Only the female incubated for 13 days in the wild, 12-13 days (2) in aviary birds. During this period the male feeds the female on the nest. The young leave the nest at about 12-13 days with aviary birds at 12-14 days (2).

The ROCK BUNTING *Emberiza tahapisi* is more commonly known as the Cinnamon-breasted Rock Bunting and Seven-striped Bunting. It takes seeds on growing plants such as Love Grass *Eragrostis* spp. and insects in the form of beetles, grasshoppers and hairless caterpillars. A small *Melolonthid* chafer beetle has also been recorded. Aviary birds have readily accepted the seeds of hay *Chloris virgata*, Teff Grass *Eragrostis tef*, Berg Grass *Setaria appendiculata*, Polo Grass *Hyparrhenia cymbaria* and Common Thatch Grass *H.hirta*. Livefood is taken in the form of beetle larvae, including mealworms, termites, gnats, fly larvae or "maggots", wasp larvae or "grubs", thrips-nymphs, hairless caterpillars, spiders, millipedes and small slugs.

The Rock Bunting starts to breed from November-February in the Transvaal, Orange Free State and Natal provinces of South Africa and January-June, November-December in Zimbabwe when it constructs a basin-shaped nest of grass and roots, lined with finer grass and rootlets placed at the base of a grass tuft, amongst stones, earth bank or in a rock crevice.

Two to four, usually three eggs are laid. They are white, bluish white or greenish white, spotted and blotched with red-brown, dark brown and slate grey. Egg measurements average (41) 17.5 x 13.2mm (16.4-18.6 x 11.9-14.4). Incubation is by both sexes in the wild for 12-14 days, males observed not sitting tight in aviary birds (2). Nestling period 14-16 days; young fed by both parents.

The CAPE BUNTING *Emberiza capensis* has been given alternative names such as the Three-streaked Bunting, Cape Rock Bunting and Southern Rock Bunting. Its diet includes seeds, insects and arthropods with the red arils of Rooi-kranes *Acaciacyclops*, grasshoppers, beetles, termites and spiders being recorded. Aviary observations have revealed the

taking of seeds of hay *Chloris virgata*, Heartseed Lovegrass *Eragrostis capensis*, Narrow-heart Lovegrass *E. racemosa*, Speckled Vlei Grass *E. bicolor*, Weeping Lovegrass *E. curvula*, Teff Grass *E. tef*, Guinea Grass *Panicum maximum*, Blue Panic *P. laevifolium* and livefood, namely beetle larvae, including mealworms, termites, hairless caterpillars, moths, fishmoths, grasshoppers, thrips-nymphs, fly larvae or "maggots", wasp larvae or "grubs" and spiders.

The Cape Bunting constructs a ragged cup of twigs, roots and grass, lined with vegetable down, grass and hair, with an internal diameter of 6.2cm and a depth of 7.7cm. Nests are built on the ground, in a low dense bush or creeper with a record of one being found in driftwood caught up in the roots of a tree after a flood. The breeding season is from October to March in the Orange Free State, October to November in the Transvaal, November to April in the eastern Cape Province, South Africa and November to June in Zimbabwe. Two to five, usually three eggs are laid. They are white, pale cream, bluish white or greenish white, spotted and blotched with red-brown, purple and ash-grey. Egg measurements average (62) 20.3 x 15mm (17.9-23.2 x 13.6-16.4). The incubation and nestling periods are not recorded in the wild, but in aviary birds incubation is recorded as 13-14 days (2); nestling period 17-19 days (2); young fed by both parents.

The CABANIS'S BUNTING *Emberiza cabanisi*, or to give it its alternative names Cabanis's Yellow Bunting, Three-streaked Bunting, Yellow Bunting and Yellow-bellied Bunting, is recorded as feeding on seeds, fallen grain, such as millet and rice, and insects notably grasshoppers and beetles. In the aviary it has been observed feeding on the seeds of Natal Redtop *Rhynchelytrum repens*, Natal Panic *Panicum natalense*, Guinea Grass *P. maximum*, mealworms, grasshoppers and crickets.

The Cabanis's Bunting female builds a loose shallow cup of roots, grass stems and weed stalks, lined with finer grass and rootlets. It is placed 1-5m above the ground in a bush or tree. In West Africa it has been recorded utilising a Yam vine or banana plant. In captivity it has built on the ground (1). The breeding season is January to March, September to December in Zimbabwe. Two to three eggs are laid which are usually white or pale green, scrawled and blotched with brown and grey often around the thick end. Egg measurements average (11) 20.0 x 14.7 (18-21.9 x 14.1-15.1). Incubation is by the female, the period of which is not recorded in the wild, aviary birds 14 days (1); nestling period not recorded in the wild, aviary birds 16 days (1); young fed by both parents.

Aviary observations of *Emberiza* have revealed that the legs of grasshoppers, crickets and mantids are carefully removed before feeding

to young. Livefood is fed for the first 7-11 days after which seed is added to their diet. Nest construction is carried out by the female with the male in constant attendance, following her on nesting material collecting trips. Males are often seen sitting close to incubating females. Young birds are fed for a further 8-10 days by the male after leaving the nest. An attempt to eat dry seed has been observed at 12-15 days after leaving the nest. Aviary birds will accept a basic of four parts yellow manna, one part red manna, two parts canary and one part white millet. Fresh washed greenfood should be supplied regularly in the form of chickweed, watercress and thistle to complete a good staple diet. Crushed oyster shell or cuttlefish 'bone' will act as a valuable adjunct to grit. Prepacked canary rearing food mixed with crumbled hard boiled egg is acceptable to adults feeding young. Branches fixed to the battens of the aviary will encourage the birds to construct their own nests. Nesting receptacles such as the wicker canary cup and half-open nest boxes have been utilised in the past. Nest lining material in the form of hessian, pampas grass plumes, moss, coconut fibre, animal hair, wool, feathers, string and partly dried weeds will be adequate.

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BIRD SPECIES BRED DURING 1989 AT THE ZOOLOGICAL SOCIETY OF SAN DIEGO, CALIFORNIA, USA.

By Alan Lieberman, Curator/Birds, San Diego Zoo
William Toone, Curator/Birds, San Diego Wild Animal Park
Cyndi Kuehler, Staff Zoologist.

1989 was an exciting as well as productive year for the Zoological Society of San Diego. A total of 128 different species were bred at the San Diego Zoo and the San Diego Wild Animal Park, (104 species and 36 species respectively). Some of the more notable breedings were Mantell's Brown Kiwi (third year), Milky Stork, California Condor (second year), African Pigmy Falcon (second year), Congo Peacock, Buff-crested Bustard (second year), Celebes Quail Dove, Jambu Fruit Dove, Beautiful Fruit Dove, Superb Fruit Dove (second year), Tahitian Lory, Desmarest's and Edwards' Fig Parrots, Thick-billed Parrot, Blue Whistling Thrush, Golden-masked Tanager, and 6 species of mynah; Grosbeak, White-collared, Golden-breasted, Celebes, Gold-crested and Rothschild's.

The breeding of the Milky Stork was one of the most rewarding breedings of 1989, especially since it occurred in the newly opened Tiger River exhibit at the zoo. The Marsh Aviary within this new development exhibits Lesser Adjutant Storks, Blackheaded Ibis, Javan Pond Herons, White Spoonbills, Radjah Shelducks Indian Pygmy Geese, Javan Whistling Ducks, and 10 species of softbills and other wading birds. The Milky Storks are exhibited in a small flock of 2 males and 2 females. They arrived in San Diego as juvenile birds in May, 1987, and only one pair of birds successfully nested in 1989. They made their nest in an artificial basket placed about 10' (3.3m) high in a tree overhanging the water. A total of eight eggs was laid in two clutches and pulled for artificial incubation. Three eggs were infertile, one egg was eaten by a Lesser Adjutant Stork and four eggs were fertile and hatched. Artificial incubation and hand-rearing is selected in those cases in which the bird density and species composition in the mixed aviaries places reproductive efforts of the more valuable species at risk. The eggs were incubated at 99.0°F and 80.0°F wet bulb. The chicks were hatched at 98.5°F and 88°F wet bulb. The nestling diet consisted of chopped newborn mice and fish supplemented with chalk and vitamins. Diet was gradually changed to young mice and larger chunks of fish as the chicks grew.

For all of the mynah species except for the Rothschild's Mynah, artificial incubation and hand-rearing was elected with a number of eggs.

Artificial incubation in all cases was done in a Petersime incubator at 100.5°F and 87°F wet bulb. Hatching was done at 99.5°F and 88°-90°F wet bulb. The variety of nests included English parakeet boxes, artificial logs formed out of bark, and standard budgerigar boxes. Nesting materials included grasses, leaves, twigs, palm fibres and fern fronds.

Clutches and incubation periods for each mynah species were noted to be as follows: Grosbeak (3-5 eggs, incubation=13-15 d), Gold-crested (3-5 eggs, incubation=15 d), Golden-breasted (1-2 eggs, incubation=15-16 d), White-collared (3-5 eggs, incubation=14 d), Celebes (2-3 eggs, incubation=18 d). Nestlings were reared on a diet which consisted of cat-chow mixed with papaya and apple sauce. Chicks were gradually weaned onto a diet containing cricket abdomens, hard-boiled egg, newborn mice, waxworms, mealworms, chopped fruits, bird-of-prey diet, and red-worms. Of the five species of mynahs, 15 chicks were produced through artificial incubation. Of these, 12 chicks survived.

The authors would like to acknowledge the hard work and creative efforts of the keeper staff at both facilities which produced such a spectacular breeding season. Credit for the 1989 reproductive successes must go to those dedicated to the keeping of the Society's animal collection.

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NEW SPECIES OF AMAZON PARROT DESCRIBED

By Rosemary Low
(Gran Canaria, Spain)

An ornithological discovery of major interest to aviculturists is that of a new species of Amazon. *Amazona kawalli* was formally described in *Revista brasileira de biologia* (published in Rio de Janeiro) by Grantsau and Camargo (1989). Their paper suggests that the species was previously undescribed because it was confused with the Mealy Amazon *A. farinosa*.

This is indeed the case. A specimen now known to be of *kawalli* was exhibited at London Zoo from at least the early 1970s until the mid-1980s or after. It was labelled as *farinosa*. (I referred to this bird in the first edition of *Parrots, their care and breeding*, p497, in the mistaken belief that it was *mercenaria* - a much smaller species).

Amazona kawalli is immediately distinguished from *farinosa* by the crescent-shaped area of bare white skin from the cere to the base of the lower mandible. This feature distinguishes it from all other Amazons. The cere is dark grey and periorbital skin is light grey. The beak is partly yellow-horn colour and dark grey on the culmen.

Size and shape are similar to the Mealy Amazon. The authors examined two living birds and one skin belonging to Nelson Kawall, also the type female, and compared these with 34 skins of *A. farinosa* from Brazil. In the latter the culmen length varied from 34mm to 43mm and the wing length from 126mm to 149mm. In the type female of *kawalli* the culmen measured 36mm and in one male 35mm; in the type female the wing length was 120mm (not stated for the male).

The plumage of *kawalli* is a more uniform green, compared with *farinosa* and without the mealy suffusion. The head is described as emerald green. Carpal edge of the wing is light yellow-green. The feathers of the nape and scapulars are margined with black.

The tail is a very distinctive feature of this Amazon. On the lateral rectrices is a large area of red on the outer web; the tip of the tail is yellowish-green and the central part of the outer web is dark green. The wing speculum is scarlet.

Amazona kawalli originates from north-western Brazil in the state of Amazonas. The type specimen is from the Rio Juruá. The male described was from Santarém, Pará, collected there by Rolf Grantsau in 1970, and two live birds in the collection of Nelson Kawall are from an area approximately 100km south of Santarém.

Mr Kawall, in whose honour the species has been named, has almost certainly kept a large and varied collection of Brazilian parrots for longer than anyone in Brazil. His interest in mutations is well known and some of his mutation *Aratinga* conures have bred to several generations. He has bred, among others, the Red-tailed Amazon *A.brasiliensis* and the Queen of Bavaria's Conure *Aratinga* or *Guarouba guarouba*.

I had the pleasure of visiting him and his wife two years ago in Sao Paulo and of seeing the then unnamed *kawalli* in his aviaries. It is a fitting tribute to a very knowledgeable man that this species should be named after him. Equally knowledgeable - and surely one of the most prolific natural history artists who ever lived - is Rolf Grantsau. His illustration of *kawalli* accompanies the description.

The authors point out that a photograph of a bird of this species (the specimen formerly at London Zoo) can be found on p184 of *Enzyklopädie der Papageien und Sittiche* by K. Bosch and U. Wedde.

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BRITISH SOFTBILL IMPORTS PART 3

Turdidae to Eurylaimidae

By Jeffrey Trollope
Middlesex

TURDIDAE - THRUSHES

Many species once frequently imported in this large family have been less often available since 1980. However, some species seldom imported or probably imported for the first time, have been advertised occasionally, usually from South East Asia and China, and often received as secondary imports from Europe.

In the genus *Turdus* few New World species have been imported in recent years, only Rufous-backed and Rufous-collared Thrushes having been available. The African Kurrichane and Olive thrushes have also been occasionally listed. Asiatic members of the genus, have been represented by the Black-breasted Thrush, Island Thrush, Pale Thrush and Eye-browed Thrush but the Grey-winged Blackbird, once a fairly frequent import from the Indian sub-continent, has seldom been available.

Imports of the genus *Zoothera*, have included the Asiatic Siberian Thrush, Orange-headed Thrush, and Chestnut-capped. The Abyssinian Ground Thrush has also been listed.

The Blue Whistling Thrush, is probably the only species in the genus *Myiophoneus* available in recent years. *Monticola* species imported have included the Asiatic Blue-capped Rock Thrush. The only African species listed has been the Angolan Rock Thrush.

The monotypic River Chat, *Chaimarronis* and Indian Robin, *Saxicoloides fulicata* have been imported. Species in other genera, have included: *Saxicola*, the White-tailed Stonechat, Pied Bushchat, Jerdon's and Grey Bushchats; *Cinclidium*, the White-tailed Blue Robin, Blue-fronted and the Sunda Blue Robin, a possible first importation; *Rhyacornis*, Plumbeous Redstart; *Phoenicurus*, the Blue-fronted, Daurian, and White-capped Redstarts.

Three species of Forktail *Enicurus* have been available, the White-crowned, Spotted and Little Forktail. It is probable that these species had not been imported before 1980.

Species imported in *Copsychus* have included the White-rumped or Common Shama and on a few occasions, the Rufous-tailed Shama. The Magpie Robin has also been imported fairly frequently, considering the reduction of exports from countries of origin.

The African Morning Warbler and the Spotted Morning Warbler *Cichladusa*, and the Snowy-headed Robin Chat *Cossypha niveicapilla* have occasionally been imported. At least nine species in the genus *Erithacus* have been available in recent years: The Orange-flanked Bush Robin, Golden, White-browed, and the Collared Bush Robin (or Johnstone's) a species not imported before 1980, The Indian Blue Robin, Siberian Blue Robin, Rufous-tailed Robin, Siberian Rubythroat and Himalayan Rubythroat.

The White-browed Shortwing, *Brachypteryx* has been imported and possibly other species which have been advertised as "Shortwings".

BOMBYCILLIDAE - WAXWINGS

The Cedar Waxwing has been frequently available in recent years, and on a few occasions, the Japanese Waxwing, a species probably not imported before 1980.

LANIIDAE - SHRIKES

Two African species in the genus *Lanius* have been imported, the Common Fiscal and the Long-tailed. The Asiatic Bay-backed Shrike and the Long-tailed, have been available. In *Telophorus*, the Many-coloured Bush-Shrike and the Four-coloured; *Corvinella* the Magpie Shrike; *Malaconotus*, the Grey-headed Bush-Shrike; *Laniarius*, Slate-coloured Boubou, Black-headed Gonolek, Barbary Shrike, Tropical Boubou, Southern Boubou; *Tchagra*, Brown-headed Bush Shrike, Black-headed Bush Shrike and Black-capped Bush Shrike.

PRIONOPINAE-HELMET SHRIKES

Three species of Helmet Shrikes have definitely been imported: the White-crowned Shrike, the Straight-crested Helmet Shrike, and Ruppel's Shrike. Possibly other species, which have been advertised as "Helmet Shrikes".

IRENIDAE-LEAFBIRDS

The Ioras *Aegithina* have been represented by the Common Iora and the Green. Five Leafbird species *Chloropsis* have been available: the Golden-fronted, Hardwick's the Lesser and Greater Green and the Blue-winged. The Fairy Bluebird *Irena puella* has been frequently available during the last few years. It is interesting to note that this is the only genus in *Irenidae* which has been bred in the U.K.

PYCNONOTIDAE-BULBULS

It would appear that more Asiatic Bulbul species have been imported in recent years, than prior to 1980. This is probably due to shipments from Hong Kong being collected from a wider geographical area and shipments received as secondary imports from Europe.

Species in the genus *Hypsipetes* imported have included the Black Bulbul, the Ashy, Chestnut, Rufous-bellied and Streaked. In *Criniger*,

Yellow-bellied Bulbul, Grey-cheeked, Puff-throated, White-throated, Ochraceous, Finsch's Bulbul; In *Chlorocichla* the Yellow-throated Greenbul. In *Pycnonotus* the Spectacled Bulbul, Red-eyed, Streak-eared, Yellow-vented, Flavescent, Stripe-throated, Puff-backed, Sooty-headed, Red-vented, Orange-spotted, White-cheeked, Light-vented, Brown-breasted, Red-whiskered, Grey bellied, Scaly-breasted, Black-crested, Black-headed, Streaked, Straw-headed and the African Black-capped.

The Collared Finchbill *Spizixos semitorques* has been imported fairly frequently since 1980 and has been bred on a number of occasions. As far as I can ascertain, the species was not imported before 1979. The only congeneric, the Crested Finchbill, was in the London Zoo collection prior to 1927. This is the only record I can trace of this species being imported.

CAMPEPHAGIDAE-CUCKOO SHRIKES

Minivet *Pericrocotus* species imported have included the Ashy Minivet, Mountain, Short-billed and Scarlet. Cuckoo Shrikes include in *Coracina* the Black-faced Cuckoo Shrike and the Black-headed. It would appear that no *Campephaga* species has been bred in the U.K.

PITTIDAE PITTAS

Asiatic species imported have included the Banded Pitta, Hooded, Blue-winged and Rusty-naped. The African Pitta, *Pitta angolensis*, has also been available.

TYRANNIDAE-TYRANT FLYCATCHERS

As with the other bird families from Central and South America, few species in this large family have been available in recent years. In *Pitangus* the Great Kiskadee and the Lesser have been imported and in *Myiozetetes* the Rusty-margined Flycatcher.

PIPRIDAE-MANAKINS

In *Pipra*, the Golden-headed Manakin, White-crowned and White-fronted have been imported; in *Chiroxiphia* the Blue-backed Manakin and in *Manacus* the Golden collared.

COTINGIDAE-COTINGAS

In *Tityra*, the Black-crowned has been imported and in *Cotinga*, the Purple-breasted. Other species may have been available, advertised as "Cotingas".

EURYLAIMIDAE-BROADBILLS

The Lesser Green Broadbill *Calyptomena viridis* has been imported occasionally and the Long-tailed Broadbill *Psarisomus dalhousiae* has also been available, a species probably not imported before 1980. The Black-and-Red Broadbill *Cymbirhynchus macrorhynchos* has been listed on at least one occasion.

Editor's Note: Some Spotted Forktails *Enicurus maculatus guttatus* and Collared Finchbills *Spizixos semitorques* were imported in a consignment of softbills by Charles Cordier in 1939.

* * *

THE PRESIDENT'S GARDEN PARTY SUNDAY 2ND SEPTEMBER 1990

Over one hundred members and their guests gathered at Chestnut Lodge, Cobham, Surrey, at the kind invitation of Miss Ruth Ezra and Mr Raymond Sawyer, President and Vice-President of the Avicultural Society. The weather was warm and sunny and, as ever, the hospitality and the gardens were superb.

This happy annual event was marred only by the recent death of Harry Horswell, Honorary Secretary and Treasurer of the Society, who will be greatly missed by us all.

Every year, as we walk around this internationally famous collection, there is always something new to see. An addition to the flamingos was a robust-looking young Caribbean, hatched in the collection. Other breeding included Avocets, Stilts, Black Crakes, Orinoco Geese, Pintails and Mandarins. Success with Psittacines included the breeding of Keas, Philippine Hanging Parrots, Red-flanked Lorries, Rosa Bourke. In the centre garden aviaries, Bay-headed Tanagers and Azure-winged Magpies were feeding fledged young.

Much admired by the visitors was a magnificent pair of Toco Toucans, as well as a pair of Spangled Cotinga and a well-coloured flock of Scarlet Ibis. In a range of recently completed aviaries were housed Green Wood Hoopoes, White-throated and White-fronted Bee Eaters, Racquet-tailed Rollers, Touracos, Giant Hummingbirds, White-crowned and Egyptian Plovers.

In a walk of enclosed aviaries we saw Beautiful, Black-naped, Superb and Jamboll Fruit Doves, Mrs Gould's, Splendid, Green-headed and Scarlet-chested Sunbirds, Royal Starlings and Yellow-fronted Woodpeckers. On our return to the lawns for tea, we saw birds ranging from Sun Bitterns to Jay Thrushes and Blue-headed Parrot Finches to Yellow Grosbeaks. We had our tea while watching Crowned and Demoiselle Cranes, Oystercatchers and Peruvian Thick-knees on the lawn. It had been a most enjoyable and interesting day.

Jeffrey Trollope

Once again we are most grateful to Miss Ezra and Mr Sawyer for giving members such an interesting and enjoyable afternoon. Those of us who were lucky enough to be able to attend were given a very privileged view of one of the world's greatest private collections, as well as delightful hospitality. In addition, Miss Ezra very generously donated to the Society's funds the proceeds from the sale of tickets, £260 including donations.

Geoffrey Greed, Hon. Secretary.

* * *

HARRY J. HORSWELL

1922 - 1990

Honorary Secretary and Treasurer 1971 - 1990

I am sure I speak for all members of the Society in expressing our sadness at the tragic and unexpected death of Harry Horswell, on 25th April, of cancer.

Harry succeeded Arthur Prestwich as Honorary Secretary and Treasurer in 1971 and through the years his enthusiasm and generosity have enabled the Society and the *Avicultural Magazine* to survive and flourish. It was never easy as the Society had no financial reserves (this continues to be our problem today) and there were quite a few occasions when Harry gave financial assistance. Members may not realise just how much hard work is involved in the day-to-day running of the Society - collection of subscriptions, dispatching Magazines and back numbers, organising meetings and catering, and coping with the very considerable load of correspondence. For 20 years Harry provided offices, facilities, storage space and staff to carry on this work, in which he was ably assisted by his wife Mary Harvey, as Assistant Honorary Secretary. Other members of the Horswell family have supported the Society over the years, notably Harry's daughter Victoria who tragically died a year before her father, also of cancer.

It is hard to believe that Harry is no longer with us but his wit, his cheerful friendliness and hospitality will always be a happy memory for his many friends all over the world. It is a measure of his contribution to the Society that the *Avicultural Magazine* is flourishing today and enjoys such international prestige and support.

Before he died Harry knew that Bristol Zoo was going to take over the management of the Avicultural Society and it pleased him very much to know that this historic society, to which he had given so much, would be in safe hands and would continue to prosper. We are indeed fortunate that Mr. Geoffrey Greed, Director of Bristol Zoo, has taken on this considerable task and I do appeal to all members to support him.

Ruth Ezra
President

Aviculturists suffered a grievous loss with the death of Harry Horswell who contributed markedly to the well-being of the Avicultural Society of which he was Honorary Secretary and Treasurer for many years and for which he worked very hard. He was responsible not only for the routine running of the Society's affairs but also for the organisation of most of its social events at which his charm, sense of humour and infectious cheerfulness contributed greatly to their success. He was a generous and excellent host and always very good company. His goodnatured opinions at council meetings and delightful presence at the Society's Social functions will be long remembered.

He was very modest about his practical activities as an aviculturist and often insisted that he "didn't know very much about birds". Of course, this was far from the truth. His avicultural interests ranged widely and many beginners are grateful for his practical advice, encouragement and genuine appreciation of their achievements however minor. His avicultural activities flourished in a big way at Sladmore Farm, near High Wycombe, where he established a large collection of waterfowl, built an excellent range of aviaries and created a beautiful tropical enclosure which housed such rarities as Umbrella Birds and Giant and Swallow-tailed Humming Birds. He was successful in breeding many species of parakeet including the Princess of Wales and the Crimson-winged, Barn Owls, Blue and Yellow Macaws and, more remarkably, Hoopoes and Purple Guans. Perhaps his most notable breeding success occurred with Chilean Flamingos when his group of six produced a chick despite the experts' insistence that successful breeding may be achieved only in very large colonies.

Subsequently, he concentrated on waterfowl at Ascot and on rare and attractive softbills, like Royal Starlings, at Hartley Witney.

Harry was a well known art expert and, at the Sladmore Gallery, which he owned, he promoted the work of many wildlife artists several of whom owe their success to his interest, encouragement and support. Some of their work, including that of David Reid-Henry, David Digby and Brian Reed, appeared through Harry's generosity, as colour plates in the *Avicultural Magazine*.

He will be sadly missed.

Professor J.R. Hodges
(Chairman of Council)
Raymond Sawyer
(Vice President)

It will not be forgotten that it was Harry's enthusiasm and generosity, supported by his wife Mary, that ensured continuity of the society from when he took over in 1971.

We shall always remember Harry for the special flair that he brought to meetings. These were so much enhanced by his wit and charm, and made such enjoyable occasions for those attending.

Dulcie and Freddie Cooke

It was with great sadness that I heard of Harry Horswell's death after much suffering. We had known one another for many years through the Avicultural Society. He was a hard worker for the Society and enjoyed meeting the bird enthusiasts.

His cheerfulness and friendliness will be very much missed by us all. He had many interests including his art galleries and wildlife artists. He was always a very busy person - remarkable in every venture.

D.H.S. Risdon
(Vice President)

* * *

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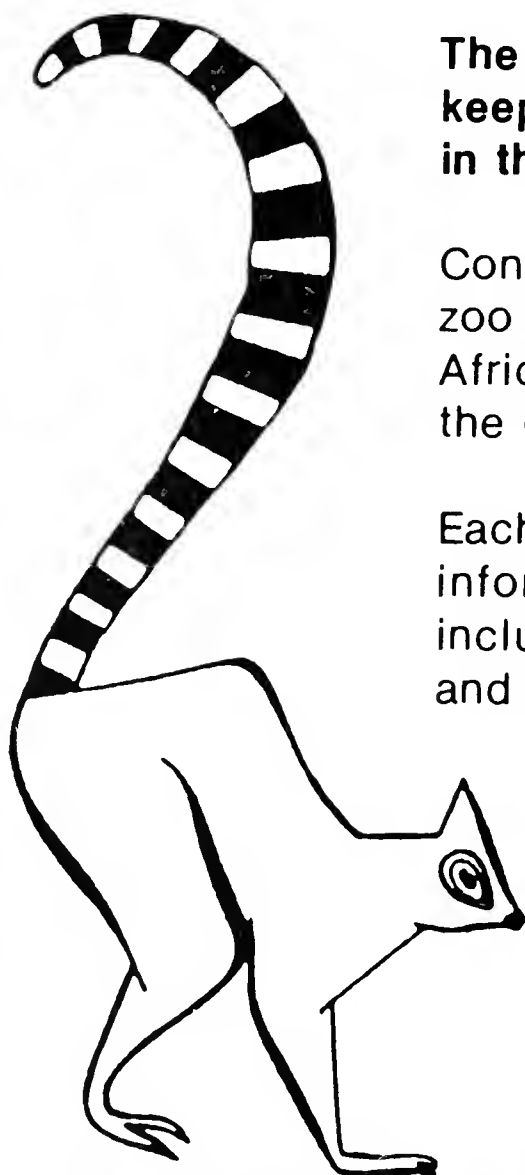
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